SCIENTIFIC AMERICAN

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THE MEXICAN RAILWAY.

In the construction of the Mexican Railway, the configuration of the country has been found to present many difficulties, and the skill of the engineers has been severely taxed, especially on that portion of the line known as the Infernillo; and on the spot depicted in our engraving (selected from *Engineering*), a bridge over a deep gorge, with a sharp curve, on a steep gradient, has been successfully constructed by the Crumlin Iron Works Company, of Monmouthshire, England. In building this viaduct, a temporary structure, with even sharper curves and steeper inclines, was used; and the value of the Fairlie engines in mountain railroading was fully proved. The stream which rushes down the narrow gorge passes 100 feet below the viaduct, at the foot of the deep slope of broken rock, fallen from the hills above, on which the stone work for the piers and abutments had to be erected. The rocks above overhang the work, projecting in many places beyond the center line of the railway; and the workmen employed to remove these rocks were suspended by ropes and on ladders attached to the trees above.

The viaduct consists of nine spans of 51 feet each; the curve is of 325 feet radius, and the grade rises 1 foot in 25. Steel rails are laid on all the heavy inclines, and guide rails are introduced on the curves. The rails on the viaducts are carried by transverse sleepers attached to the upper member of the girder, to which they are secured by hook-headed bolts.

Make a Note of It.

Those who have never tried the experiment rarely appreciate the benefit which an enterprising, progressive mechanic derives from keeping a record of matters worth remembering. An intelligent workman, especially one who reads, is constantly acquiring interesting and useful information, which at some time he will probably have occasion to apply practically in his business. Almost every day he learns something new, and says to himself: "I must remember this;" but unless he has occasion immediately to apply his knowledge, he is very apt to forget all about it, or to retain only a vague recollection of having some time read or heard something about it. The memory, unless highly trained and naturally retentive, is a treacherous repository for odd scraps of useful knowledge not gained by experience or personal observation, and every mechanic should have a paper memory, which will never let a useful fact slip away.

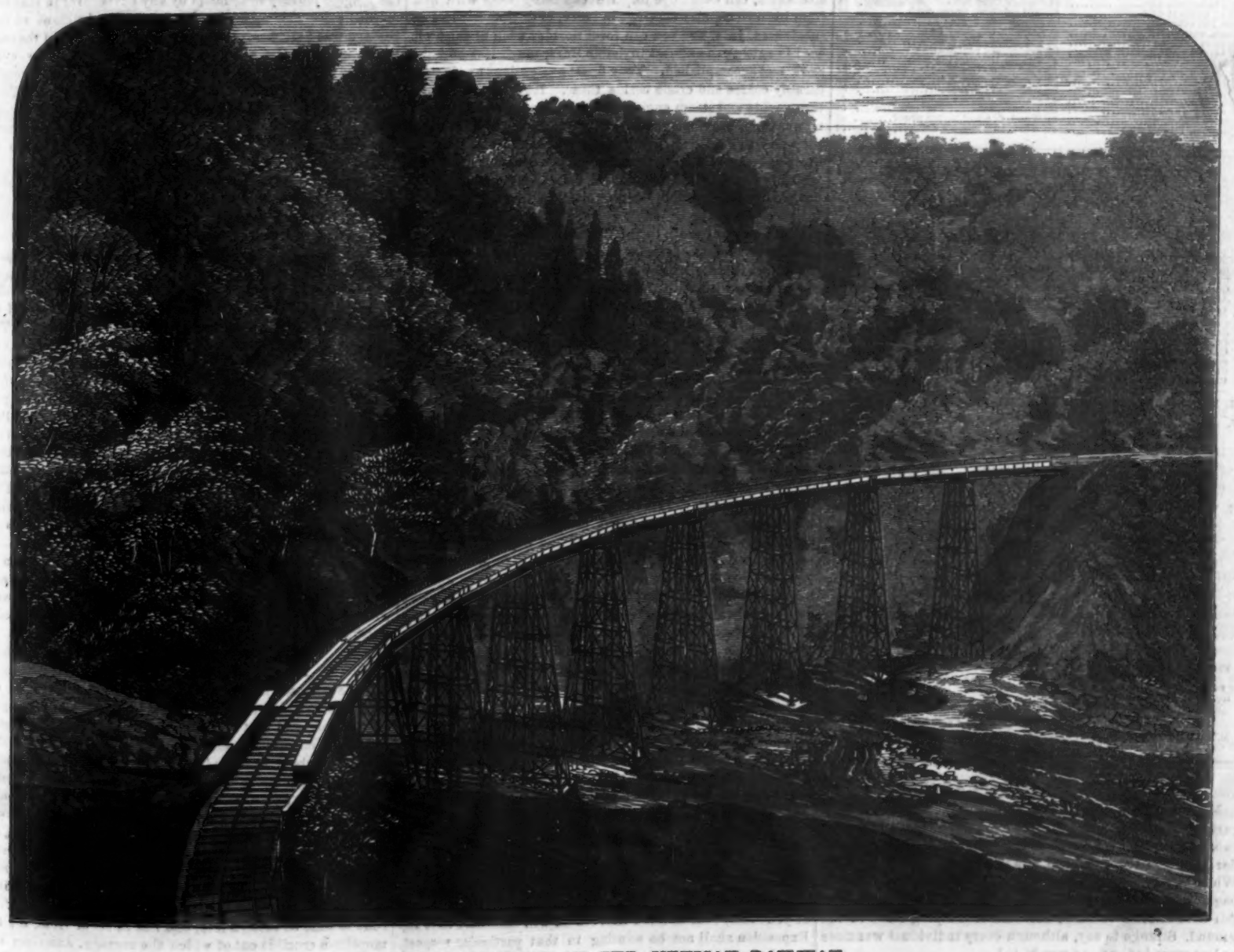
We should advise all mechanics, and especially all young men with unformed habits who are learning mechanical trades, to keep note books in which to enter anything worth remembering which may come to their knowledge. Facts learned from observation and experience, or gathered from conversation with other mechanics, useful hints gained from books, valuable suggestions, or facts of practical interest found in newspapers should always be promptly recorded and saved. When a book is full, it should be carefully indexed and laid away in some place where it will be easy of access. The mere fact of writing, especially if condensation is required, will tend to fix a fact in the memory, and give a man a more ready control of what he knows. In any case, he has the fact at command at all times, and a book such as we have described, containing the gleanings of years of study and practice, becomes of inestimable value to the possessor. We have seen mechanics' note books which would not have been given in exchange for a whole library of technical works, and we have never known a man to begin the record of facts who was not glad he acquired the habit.

We regard this as a matter of great practical importance to mechanics in the trades we especially address. No printed text books contain all the points which a smart mechanic will pick up in the course of his business, and nothing will take the place of a scrap and note book. Let our readers, young mechanics especially, try the experiment, and we promise them that they will find immediate and life-long benefit from so doing. It will be to many the stepping stone to success in life, by inculcating careful habits of acquiring useful knowledge, and making them wiser men and better mechanics than they would otherwise have become. To all young mechanics we say: Never let a fact worth remembering slip away from you. Make a note of it in some shape, and then put it where it will be accessible when you want it most. The habit is easily acquired, it need consume no time required for the performance of other and more important duties, and the pleasure which it will give will more than compensate for the trouble involved, even were no subsequent benefit to be expected from it.—*Iron Age.*

Young Lions Nursed by a Terrier.

Carefully caged in our Central Park Museum are two young cubs. They are four or five weeks old, a pair, lion and lioness, fine healthy little creatures, and are nearly old enough to be shown to the public. They are the progeny of the pair of beasts, known as Lincoln and Jenny, in the Museum. But the mother being from some cause unable to nurse them, they were at once given to a large terrier whose puppies were taken away, and who plays the part of a foster mother. She seems, indeed, as fond of the cubs as if they were her own offspring, and covers them with caresses, though they are nearly as big as she is. It is a curious fact that lions reared in captivity are not as gentle as those captured and tamed. The parents of these cubs, which were caught when wild, and tamed, are very tractable, while some of the other lions which were born and brought up in the Museum are sullen and ferocious.

TO MAKE brazing solder, ordinary brass is mixed with or melted with one sixth its weight of zinc. Pour out of the the crucible, cool, and granulate by crushing with a hammer



THE METLAC VIADUCT ON THE MEXICAN RAILWAY

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(Illustrated articles are marked with an asterisk.)

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A Disastrous Balloon Ascent.

M. Tissandier, the French aeronaut, accompanied by a party of distinguished scientific gentlemen, recently undertook an ascent over Paris in the ballon *L'Univers*, in order to make topographical drawings of the fortifications. While at a hight of 750 feet the balloon exploded; the great bag at once emptied itself, and the car with its occupants fell with terrible velocity, the former burying itself in the ground. Strange to say, although every individual was more or less wounded, no one was killed.

WHAT WORKING MEN SHOULD EXHIBIT AT THE CENTENNIAL.

A paragraph is going the rounds of the daily press about an elaborate model yacht which somebody is building for exhibition at the Centennial. The hull is to be made of countless pieces of different woods, the rigging of fine silk, the fittings of silver. Every detail of a real vessel is to be repeated in miniature; and to crown all, this remarkable production is to be the work of an individual who never has been aboard the style of craft he proposes to imitate. We mention this instance merely as one of scores, similar thereto, which have lately come to our notice, and which show that hundreds of persons all over the country just at present are at work with the idea of exhibiting like results of their skill at the Exposition. In our estimation, all these people are making an unfortunate mistake, for they are simply wasting valuable time and labor to no good purpose whatever.

If the maker of the yacht above referred to can produce a model, cut roughly from a log if need be, which will possess merit for fine lines or superior design, or which will afford a new idea regarding safety, speed, buoyancy, stability, or any of the qualities sought by marine architects, then he will perform useful work; but we cannot imagine anything more useless than a miniature affair which, because built by a totally unskilled person, cannot be supposed to be a model, and which, too costly even for a child's toy, reduces itself to an evidence of the patience with which the producer has thrown away his otherwise unoccupied time. If any reader of this journal is making minute steam engines to run on a five cent piece, or building miniature furniture or ornaments of immense numbers of fragments, or trying his hand at building working models of large machines on a ridiculously small scale, or indulging in any other like effort, we earnestly counsel him to stop. We grant that model building by learners in trades often serves as excellent practice; but the attempts of tyros are not, it is presumed, ever intended for exhibition, or made with that incentive. To all working men we say: Exhibit. If you have a really nice piece of work which you can command, send it to Philadelphia; but let it be something in your own trade, that is the result of your own individually acquired skill, and not some useless though very pretty affair, tinkering at which has killed a few heavy hours. There will be committees of workmen sent over here from Europe to examine minutely everything, and to report thereon, so that no fear need be entertained but that every article in the great edifice will be critically scrutinized by experts, and judged on its merits.

It is well to remember another fact about these elaborate miniature or piecemeal productions, and that is that the yellow faced, almond-eyed Chinaman, who is now making his way in almost every town in the country, can do that kind of work a thousand times better than you, with all your skill in mechanics, can ever hope to. He can bring over with him from his own country carvings in ivory, or in that hardest of substances, jade, and you can form no idea even of the tools used in cutting the almost invisible lines, much less how the work was accomplished. Your finest productions are incomparably coarse and crude beside these. He can build miniature yachts and steam engines which will excel yours beyond all question, provided you give him something to copy, and then he will reproduce every scratch or accidental stain on the original. Clearly, then, when you attempt the work which is peculiar to the country of the cheapest of cheap labor, you only depreciate your own toil by inviting an unfortunate comparison.

What we want to see in the Centennial are first, new ideas, secondly, evidences of trained and skillful workmanship. Of the former there will be no lack; whether the same will be true of the latter rests with the workmen themselves. We want a display that will tell the world that, besides possessing the ablest inventors, the United States contains the men who can put ideas into shapes that cannot be excelled. Therefore if you have spare time, do not waste it in producing something which does not, but something that does, tell this fact. Do not make fancy inlaid work or build boats, unless such is your trade; if it be, strive to make the best inlaying or the neatest model you ever produced. But if it be without your trade, let it alone; you can no more hope to compete with those whose trade it is to make such things than they with you in your particular branch of industry. If the article you are to exhibit is within your own calling, and is to be the labor of yourself alone, there lavish your work. If the object is of metal, make pattern after pattern until you get a form on which you can imagine no improvement. If you can hit upon a new design—and new designs are sadly needed for a great deal of useful machinery—so much the better. Then try until you obtain perfect castings; and this done, fit the parts to perfection. Do not finish with nickel or silver plate, but go at it with the file. If you know anything about the delicate and beautiful mechanical operation of polishing with that tool, let the world see that you do. It is evidence of superior mechanical skill, and proof that no defects are hidden, as might be the case under a film of plating. If you are laboring on only a part of a machine, and fellow workmen are doing the rest, exhaust all your efforts on your part. It will have the salutary effect of making your comrades do likewise, almost despite themselves, for the finish on the machine must of course be uniform; and besides, your employer will hardly refuse to give you the public credit which would be but a just recompense for your skill and industry.

In a word, stick to your own business, and let that of other people alone. If you are tempted to work on something out of your line, bear in mind that others will take care that the Exposition shall not be wanting in that particular respect, and that your amateur help in supplying a deficiency would be the last required. Show the world the very best you can do in your particular calling, and this without regard to whether your labors tend to the production of a magnificently finished engine or a neatly forged bolt.

STANLEY, CAMERON, AND NORDENSKJOLD.

The year 1875 will ever be a memorable date in the history of geographical discovery. Within the twelvemonth two of the most important questions of African geography have been settled; and in the far north the demonstration of an open water way between Europe and the countries drained by the great Siberian rivers is perhaps the most important addition to geographical science that could be made in polar regions. Certainly there remains for no future year so many firstrate problems to solve.

The source of the Nile! For twenty centuries it has been the goal of the explorer's ambition. The boldest spirits have essayed its discovery, only to be turned back by insuperable obstacles. Its conquest waited for the plucky energy and resistless push of Stanley.

Starting from Zanzibar in November, 1874, with 300 soldiers and carriers, an important part of whose luggage was the open boat Lady Alice, in sections, Stanley had before him 700 miles of unknown country—part forest and part desert—much of it swarming with hostile savages. By dint of resolute marching and fighting, he accomplished in a hundred days what in the usual course of African travel would have taken as many weeks, though at the cost of half his command; and on February 27, he caught his first glimpse of the great lake with which his name must hereafter be inseparably associated.

Speke and Baker had traced the Nile to the Victoria Nyanza. What was the compass of that great freshwater sea, and whence came its supplies? Thanks to the Lady Alice, which was soon set up and afloat, these questions had not long to wait for resolution. Within the next sixty days, its shores and numerous islands had been mapped, and its tributaries noted. Of the ten considerable streams which feed the Nyanza, the largest and most important proved to be the Shimceyn, in all probability the ultimate source of the Nile. The details of the discoveries thus auspiciously begun we shall not consider here, nor the importance of the region now for the first time opened up to geography. It is enough to note that, through Stanley's daring energy and genius for command, the question which, more than any other, has vexed geographers and challenged explorers for two thousand years has been substantially settled.

In the meantime Cameron has taken up the unfinished work of Livingstone, and—spurred on no doubt by a determination not to be forestalled by his Yankee rival, as he was in the search for Livingstone—he has overcome the obstacles that baffled the veteran explorer, and accomplished perhaps the longest journey ever made by any adventurer in that benighted continent. And its results are as brilliant as the passage was heroic. No other explorer ever crossed the continent so near the equator; and none save Stanley ever achieved so much in so little time. His path lay through the most difficult and dangerous part of Africa, from Tanganyika to the mouth of the Congo; and when the story of the passage is made known, it will, nay, it must, present some of the most stirring chapters of dashing adventure in the history of African exploration.

One thing is certain: The theory of Livingstone has been disproved; and not the Nile, but the Congo, receives the drainage of the great interior basin of the continent. And Africa hides no other secrets to compare with the two which Stanley and Cameron have, within the same few months, manfully wrested from her jealous keeping.

Less significant geographically, but of far greater promise commercially, is Professor Nordenskjold's discovery of an open passage by sea between Europe and Northern Asia. The tract of country thus brought into economical communication with the rest of the world is a vast and largely fertile region, much of it splendidly timbered, traversed by navigable rivers, and only waiting for a suitable outlet for its productions, to become densely peopled. According to Professor Baers the valleys of the Obi-Irtsch and the Yenisei exceed in extent the combined areas watered by the Don, Dnieper, Dniester, Nile, Po, Rhone, Ebro, and all the other rivers flowing into the Black Sea, the Mediterranean, and the Sea of Marmora. The entire region made directly accessible to commerce is estimated by Dr. Petermann to embrace an area one fourth greater than all non-Russian Europe.

The attainment of the pole would give greater renown to the explorer who should succeed in reaching it; but the consequences to humanity would be insignificant compared with those quite certain to flow from this much needed waterway to the heart of Asia.

PHOTOGRAPHING THE INVISIBLE.

Dr. Schnauss, in *Photographisches Archiv*, essays to enlighten his countrymen with regard to the so-called spirit photographs and that sort of thing, and endeavors to shoulder the blame of such deceptions or delusions upon "that land of humbug, America."

Humbugs do flourish here, we are sorry to admit: humbugs of every grade, from the mysteries of Mumbo Jumbo, devoutly believed in by too many citizens of African descent, to the finer mysteries of Baron Reichenbach's odic force, not less devoutly believed in by many citizens not of African descent. With such a composite population, constantly reinforced by emigrants from every quarter of the globe, it is not surprising that every variety of superstition should from time to time be thrown into, and rise as scum from, the cosmopolitan crucible out of which the average American citizen proceeds. It is not surprising either that keen-witted

and unscrupulous people—too many of them to the manor born—should take advantage of the credulity of the undeveloped citizen, to their own gain and their victim's detriment. Such is the natural consequence of the mixture of diverse grades of civilization. All we claim is that, with time and widening experience, the over-credulous have their wits sharpened and their eyes opened; and if it were not for the constant accession of raw material to be imposed upon, humbugs would die a natural death, even in this favored land of humbugs.

Dr. Schnauss's illustration of American iniquity (so-called) is a case in point. He charges us with the invention of "spirit photography:" then serenely proceeds to demonstrate that his own countryman, Baron Reichenbach—aided and abetted by "a large number of scientific men"—produced the first spirit photographs, in the capital of German intellect, Berlin. What is even more amusing, our learned Doctor goes on to state, as a demonstrated fact, that "several bodies appear luminous to people after their eyes have been accustomed to darkness, as for instance large steel magnets and big crystals; water shaken up in a bottle will emit phosphorescence, and luminous waves may at times be seen coming from the fingers, sometimes greenish, sometimes reddish, according to the side of the body."

We have been laboring under the impression that these pretended appearances were in reality all in the observer's eye—illusions, in fact, the "sensitive" witness seeing simply what he looked for: a position supported by not a few experiments, wherein the doubly deceived observer was led to see what from his own theory could not exist—"magnetic" flashes, for instance, proceeding from a wooden magnet(?) deceptively painted. But to Dr. Schnauss they are actual verities, as he has "seen similar luminous phenomena in the persons of somnambulists." He has gone further, and repeated, "with great care and attention," the photographic experiments of the father of spirit photography, on the strength of which he renders the verdict that the luminosity emanating from one's fingers' ends, etc., as seen by very sensitive persons, is not, as Reichenbach supposed, identical with solar rays!

If the Doctor is a fair specimen of his country's intellectual productions, we may at once abandon all hope of eliminating humbug, so long as emigration continues. Supply always follows demand. But we will give our censor credit for one thing: he has learned, though tardily, what was shown long ago in the SCIENTIFIC AMERICAN, that a genuine "spirit photograph" may easily be obtained, provided the precaution be taken to sketch the required ghost upon the back ground with some colorless fluorescent material, as, for example, a solution of sulphate of quinine. Though invisible to the eye, such a sketch will appear in the picture, as perfect a ghost as the most credulous could wish to see.

ONE OF MR. EDISON'S CURIOUS EXPERIMENTS.

If the dark box (illustrated in SCIENTIFIC AMERICAN of December 25, 1875) provided with two carbon points be brought within a short distance of any of the working telegraph sounders, used at the Western Union Telegraph Office, Dey street and Broadway, the sparks, heretofore described by Mr. Edison, he states, at once make their appearance between the points. The flashes thus produced correspond with the opening and closing of the circuit of the magnet, and thus the signal or message that is passing through the instrument is reproduced in the form of light, within the Edison box. No connection of the carbon points by wires with the telegraph instrument is necessary. Simply bringing the box near to the instrument is sufficient.

WHO INVENTED THE BARREL?

Few inventions have had a wider or more varied usefulness than the barrel; few give such promise of perpetuity. Unique in principle, simple yet singularly perfect in plan and structure, the barrel is little less than a stroke of genius. Who set up the first one? Who first conceived the happy thought of making a vessel tight and strong out of strips of wood bound together with hoops? And when did he live?

No history of inventions, none of the encyclopedias in our great libraries, no historian of human progress, so far as we know, gives any information on the subject, unless we except the Roman author Pliny, who mistakenly attributes the invention to the Gauls who inhabited the banks of the Po. We say mistakenly, since there is the best of good reason for believing that the barrel was in use long before the Gauls took possession of their Italian home, perhaps long before the Gauls existed as a people.

The monuments of Egypt furnish proof of the early use of hooped vessels, though no date is given of their invention. In one of the inscriptions copied by Wilkinson may be seen two slaves emptying grain from a wooden vessel made with hoops, while a scribe keeps tally, and a sweeper stands by with a broom to sweep up the scattered kernels. Close by an unfortunate is undergoing punishment by bastinado, for short measure perhaps, or, as Mr. Wilkinson suggests, for petty theft. The measure is barrel-shaped, and precisely like the *kayl* of modern Egypt. It would hold, apparently, about a peck. Unfortunately the age of this inscription is not indicated. Measures of the sort would seem to have been in common use very early in Egypt, though not for the storing of liquids, for which purpose skins and earthen vessels were employed.

At first thought, Egypt would be the last place to look for the invention of hooped vessels, its arid climate making it specially unsuited for their employment. Possibly, however, that may have been the compelling cause of their invention.

Throughout the East, the bamboo is largely used for making hollow vessels, a section of the stem through a node securing a solid bottom, and one between the nodes an open mouth for a natural tub or bucket. In well wooded regions, nothing would be more natural than the employment of hollow tree trunks for the same purpose, or sections of tree stems, hollowed out by fire or otherwise. In drying, such vessels would split and spoil, and it would require no great genius to repair them by means of withes or wooden bands, the primitive form of the hoop.

If the users of such natural barrels should migrate to a region where timber was scarcer, economy of lumber would be likely to suggest the building of barrels from pieces artificially split, in short, the use of staves, by means of which the primitive cooper would be able to make several barrels out of a block that would suffice but for a single dug-out.

But this is speculation merely. It is enough to know for a certainty that the cooper's art, like the potter's, is one of extreme antiquity. We had no suspicion of its venerableness when we began to trace its history in response to the inquiry—who made the first barrel?

LOWER CALIFORNIA.

Peninsular California has had the name of being about as worthless a strip of land as the Continent affords—rocky, sunburnt, and barren. Its inhospitable mountains, however, appear to be well stocked with precious minerals, and its shores are not without the elements of fertility for other lands, even if themselves are infertile. The United States steamer Narragansett has been making a survey of the coast, the reports of which show that the mineral wealth of the country is wonderful, embracing rich deposits of silver, gold, iron, copper, antimony, alabaster, and salt. At Triunfo a silver-mining company is producing bullion to the amount of $50,000 a month. The mines are very rich. At Purgatoria and Providencia copper mines are being actively worked, and are yielding large quantities of rich ore, which is brought to the seashore on pack mules to be shipped to San Francisco and Europe. At the island of San Marios, there is a rich mine of alabaster, capable of yielding an immense profit if properly worked. At Carmen Island is a salt deposit a mile and a half long and a half a mile wide, depth unknown. The salt is pure and beautifully crystallized. It lies in a natural evaporating pan some 400 yards from the sea, with which it is connected by underground passages. Another source of wealth is the guano islands, especially Isla Raza, from which 10,000 tuns of the fertilizer have been taken. It is computed that as much as 60,000 tuns more lie upon a strip of shore three quarters of a mile long and half a mile wide. The Gulf of California abounds in whales, sharks, swordfish, saw fish, skates, porpoises, seals, turtles, and small fish in great variety. The presence of fossil shells of existing species, at an elevation of 1,000 feet or more above the present sea level, indicates that at a geologically recent period the peninsula was an archipelago, the high mountainous land at the southern extremity forming a single large island.

A California paper reports the recent arrival in San Francisco of the first successful shipment of canned turtles from Guaymas. The turtles of the Gulf are very abundant, and are equal in flavor to the best West India turtles; but they suffer on the voyage so that they cannot be brought alive to the California market. By canning them, it is found possible to place their much appreciated meat, in excellent condition, within the reach of all at moderate prices. Guaymas alone can furnish 200 tuns of the meat annually. The turtles weigh from 25 to 250 lbs., but they will not average more than 15 lbs. of meat, so great is the proportion of refuse. It is expected that canned lobsters, cuttlefish, rock cod, and other delicacies from the Gulf will soon be added to the food resources of the Pacific coast.

RAPID BRIDGE BUILDING.

On the 20th day of November last, the Market street bridge, over the Schuylkill river at Philadelphia, was, with the exception of its piers and abutments, destroyed by fire. The loss was a very serious one, as the bridge formed the principal connection between West Philadelphia and the city proper, while over it passed the tracks and large traffic of the Pennsylvania railroad. It was, besides, the most direct route to the Centennial grounds. So urgent was deemed the necessity of replacing the structure that, before the flames were fairly quelled, the mayor's proclamation was issued, and consultations of city authorities and engineers speedily began. Before these deliberations, however, had resulted in any definite project, President Thomas A. Scott presented himself at the mayor's office, with an offer to build a strong bridge with double the capacity of the one destroyed, to cost $65,000, or $10,000 less than the insurance on the latter. Furthermore, he would sell the structure to the city for exact cost, and have it ready for traffic by January 1, 1876.

Mr. Scott had anticipated the acceptance of his offer, and had already sent out orders to cut the timber, at various points along his road, and load it on cars. When the formal acceptance came, further commands flashed over the telegraph wires, and down came the loaded cars, attached to the lightning express trains. One hundred and fifty men stood ready on the banks of the river, tools in hand, and at the word given, on the evening of December 5, the attack on the charred remains of the old bridge began. From that moment work was unceasing; one gang of men relieved another, and torches and calcium lights gave illumination all night. Sundays and stormy days were unnoticed, and thus the labor continued, until, at one o'clock on the afternoon of December 24—three hours less than twenty-one days from the time the mayor signed the ordinance, and seven days ahead of time—the bridge was finished and formally opened to travel.

The structure—though of course but a temporary one, since it is designed at some future time to replace it by one of iron or stone—is solid and massive, and good for five or six years of constant wear. In fact, it would last indefinitely with proper repairing and replacement of timber from time to time. It has a Howe truss, and is constructed of white pine, with an oak flooring. It is 540 feet in length, the two end spans measuring 162 feet each, and the center span 216 feet. The truss is 26 feet high in the clear, and 28 feet from out to out. The width of the bridge is 48 feet including the sidewalk, which is 10 feet wide. The new structure is said to be superior to the old one. The proceeding is an example of what energy and discipline can accomplish.

WATER IN THE PIPES.

At this season of the year, and especially during cold snaps, the gas has a habit of misbehaving itself in an annoying and, to most people, incomprehensible manner. At night, and just as *paterfamilias* is about to retire, he is startled by an ominous drip, drip, apparently in the floor, sounding exactly like the escape of water from a burst pipe. With visions of soaked carpets and ruined ceilings running across his mind, he makes his way to the story beneath, with the expectation of sadly looking upon a gradually growing dark stain in the middle of the plastering. None is there, however, and he tries another room with the same result; then he goes to the kitchen and shuts off the water from the upper stories, but still the dripping sound continues. Finally, in the course of a critical inspection of the wash basins, he lights the gas in an unoccupied room, and at once the flame proceeds to execute a series of astonishing leaps and jumps. Of course, he establishes a connection in his mind between the sound in the floor and the performance of the gas flame, and thereupon, with a sigh of relief that it is only the gas, bears the less evil resignedly, out of thankfulness for the absence of a possible greater one.

Next time the trouble happens, it may occur in the parlor and ruin a projected entertainment; or in the midst of a dinner company the gas may suddenly proceed to dance and then obstinately go out, either of which proceedings will result in the discomforted host employing a plumber early the next morning. That worthy will arrive at his leisure, of course, with a helper and a couple of small boys and some candles, and with the aid of an air pump proceed to force some water out of the pipes, and thereupon send in a huge bill. In about a month, or after a few more very cold days, the gas will repeat the performance, and the plumber will find another golden opportunity, and this will be continued at intervals through the winter.

If the luckless householder venture to ask the plumber what the trouble is, "water in the pipes" will be all the information vouchsafed, and the questioner will be none the wiser as to how it got there or how it is to be kept out, other than by employing the man of lead and solder and his several attendants, which is exactly that individual's object. But we will tell you, reader, what the cause is, and how to avoid it. The true sources of the difficulty are gas traps, which are low points or depressions in the pipes, due to the latter being carelessly put in. During moderate weather, when there is no condensation of the gas, and hence no formation of water, these give no trouble; but when water does form, it of course settles in these depressions, and either shuts off the gas altogether at points beyond, or else allows the gas to pass fitfully, producing the jumping of the flame. It is obvious that forcing the water out is only a temporary remedy; and that the only proper mode of getting rid of the difficulty is either to take out the pipe and put it in straight, or else tap it at the depression and add a drip large enough to hold a pint of water. A foot of two inch gas pipe makes a drip which will rarely or never fill up, and which answers excellently for the purpose. It is often found that chandeliers fill up with water during cold weather, owing to the parlor drop being led directly from the main pipe, thus drawing into the chandelier the water which otherwise would run down the rising main to the meter. The proper plan is to cross over from the main pipe, no matter how short the distance, and then add the drop.

If occupants of city houses will bear the above in mind, and see that the plumbers strike at the root of the evil as we have pointed it out, they will save themselves sundry annoying bills, and no small amount of inconvenience.

The Localities of Malaria in the City.

The Health Board is endeavoring to ascertain the different localities on the built-up portion of this city subject to strictly malaria troubles. Not only is this inquiry to be confined to intermittent and remittent fevers, but to all the obscurer diseases in which the element of periodicity is sufficiently well marked to cause suspicion. A map of the city is sent to each physician, with the request that he will indicate the precise situation of each case of the sort which he may be called upon to treat, and transmit in due time the results of his labors. This is matter of the greatest possible importance in connection with the true sanitary interests of the city; and it is to be hoped that every medical man will do his utmost to second the endeavors of the Board and offer to it any suggestions which may tend to promote the end in view. It is by the accumulation of such reports that a scientific basis can be made for an accurate estimate of the means which may be necessary to remedy the evil.—*New York Medical Record.*

THE band saw of Messrs. Emerson, Ford, & Co., of Beaver Falls, Pa., took the $100 gold prize at Cincinnati this fall. It was used on a J. A. Fay & Co. re-sawing machine, and distanced two French band saws in the competition.

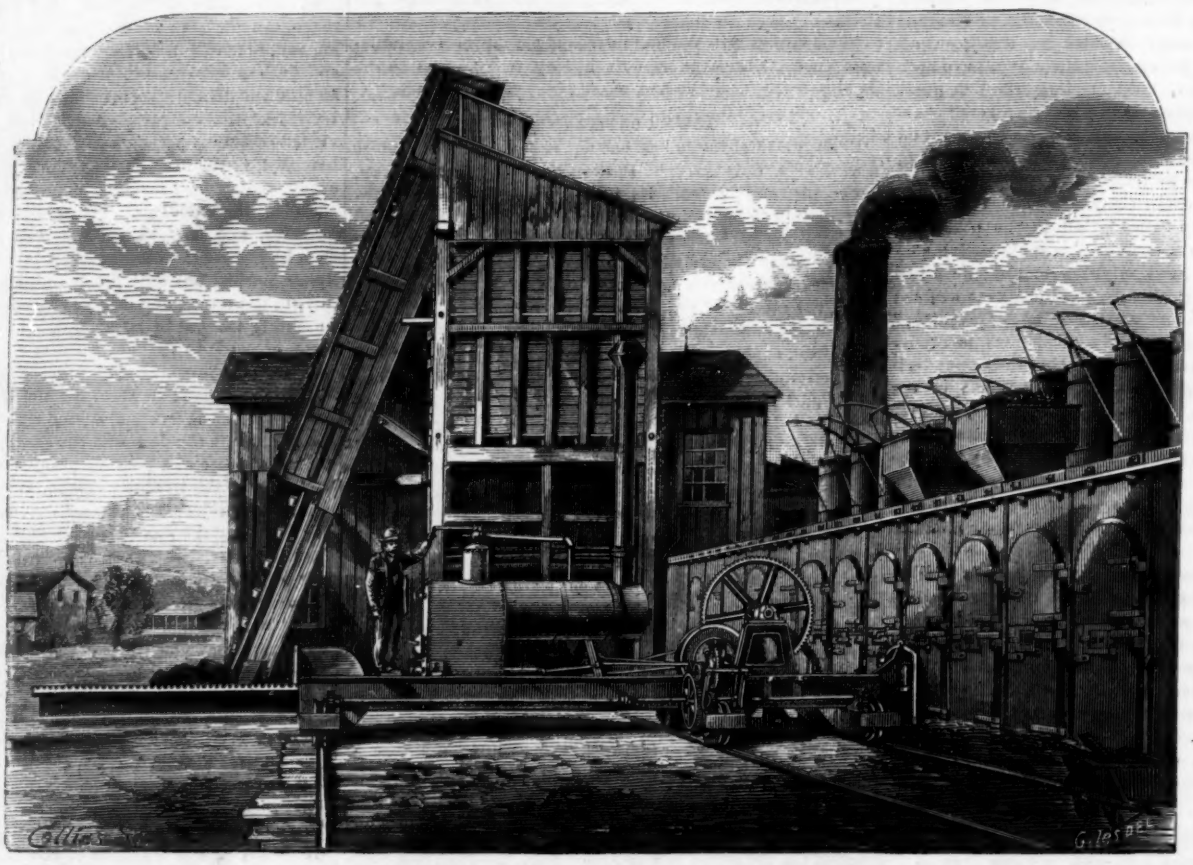
IMPROVEMENTS IN THE MANUFACTURE OF COKE.

The production of iron of a quality and at a price that will meet the wants of the consumer, and at the same time yield a profit to the manufacturer during periods of depression in the market, truthfully says *Seward's Coal Trade Journal*, requires that every step be well taken with a view that no labor be needlessly employed; that all material entering into its composition be carefully selected, and cleansed of all foreign matter before it is put into the tunnel head. It is a fact too often overlooked that, to make a good iron, pure fuel is an absolute necessity.

Bituminous coal is frequently found so mixed with sulphur, slate, and other impurities that, despite immense deposits in the immediate vicinity of points where fuel is required, its use is abandoned owing to its being unfit for the blast furnace.

In the annexed engraving are represented some new coke ovens which are said to have produced coke from coal when all previous similar attempts had proved failures. They were recently built by McLanahan, Stone, & Bayley, of Hollidaysburgh, Pa., for the Cambria Iron Co.

These ovens are 36 inches wide, 7 feet high, and 22 feet long, and present the appearance of a succession of arcades closed at each end with iron doors. They are surrounded on the two sides and bottom with combustion chambers in which the volatile matter is burnt as it passes away from the coal that is being coked. The burning of this gas maintains a high and certain heat, sufficient to coke the coal.



THE CAMBRIA IRON COMPANY'S COKE OVENS.

Charging the ovens is done by means of hopper-filling cars that run on tracks on top of the ovens; each oven has two filling holes through which the coal contained in the cars is emptied. The discharge is effected by a powerful steam ram, shown in the illustration, which moves back and forth in front of the ovens on a three-rail track. On the end of a long rack is a head which fits the oven, which is pushed through the latter by powerful gearing, and expels the coke from the door at the opposite end. The coke being left on the cooling ground on the other side of the oven, the ram is withdrawn, the door closed, covers taken from the filling holes, and coal dropped in before the oven has had time to cool. The charge for an oven is 17,500 lbs. of coal, and in 72 hours this charge is coked, producing 13,125 lbs. of coke, which is a yield from the coal of 75 per cent; the cost of labor in coking a gross tun of coke in these ovens is 36 cents. Careful experiments made with coal from the same mine coked in pits, during the most favorable weather, showed that 59 per cent from the coal, at a cost of labor of 76 cents per tun of coke, was the best that could be done. The best result in the beehive oven was 61 per cent from the coal. Taking a whole year's work, both in beehive ovens and in pits upon the ground, the yield was about 50 per cent of coke in weight from the coal.

The coal in Jackson and Vinton counties, Ohio, although existing in such great quantities, has been considered unfit for iron smelting until very recently, and it is through the application of modern improvements in the way of crushing and washing the coal, then coking it, that the great and beneficial result has accrued.

Experiments recently had at the Vinton Furnace proved eminently satisfactory. The coal is crushed and bolted almost the same as flour would be, then washed thoroughly by streams of water playing upon it constantly while it is undergoing the crushing process, until all the impurities of sulphur and slate are extracted. It is now ready to be coked.

The ovens are improved Belgian, patented by McLanahan, and may consist of any number. At Vinton there were twenty-four, each three feet wide, seven feet high, and twenty-two feet in length, built of fire brick, with iron doors at each end; the charge is 180 bushels of crushed coal; it remains in 48 hours, and is then ready to draw

The bottom and sides of each oven, as well as the tops, are solidly lined with fire bricks. All along, near the top of each oven, are small apertures through which the gas from the heated coal passes, and is carried down one side, and under the oven and up the other side, and is burnt in its passage, thus creating the heat which keeps the fire brick of the oven a bright red in all its parts. The ovens are filled from the top by means of hopper cars, which run on a track and dump coal into an aperture on each end of the oven; it is then raked level by hand through the doors, which are afterward closed and sealed up with soft clay. There is a mica-covered opening in the doors, so that the combustion may be observed, and the proper time noted for drawing. These improvements must prove of value to the locality.

The cleaning and crushing process is described as follows: The car load of coal is emptied on a sloping iron screen with bars three inches apart; the coal that does not pass through this falls on to a level screen of iron bars, where it is pounded by hand power until it all passes through. Then it passes between iron cylinders driven by steam power, and is crushed until it will all pass through a ¼ inch screen. This crushed coal is elevated precisely like flour in a flouring mill, with small buckets or scoops on an endless belt. At the top, where the belt passes over a roller, the fine coal is poured from the little buckets into a great bolt, which revolves precisely like a bolt in a flouring mill. Extending the whole length of this bolt, and directly over it, is a small water pipe, perforated with numerous small holes, through which streams of water fall upon the bolt.

The Cambria Iron Company has over 100 of these ovens in use at Hollidaysburgh and Johnstown, Pa., and the Rock Hill Iron Company employs 47 more. Patents for some improvements are now pending through the Scientific American Patent Agency, to Mr. McLanahan.

IMPROVED APPARATUS FOR EMPTYING AQUARIA.

It is not everybody that knows how to arrange a siphon for draining water out of aquaria or parlor fountains after the fish or vegetation therein have rendered the fluid foul, and to attempt to start the water running by sucking on the pipe after the siphon is placed in proper position, is often to receive an unpleasant mouthful. Emptying the water from the tank or globe, as out of a bucket, is impossible in an aquarium where there is loose rockwork, and in any event

it is a proceeding by no means calculated to improve the condition of the fish or the plants. A simple little device, however, has lately been invented which will perform the operation of removing the water very easily and surely. It is represented in the annexed engraving, and consists of a small vessel, A, in the bottom of which is a hinged valve, B, which opens inwards. Entering the top of the vessel are two tubes, one, C, merely opening into the interior, the other, D, extending nearly to the bottom. To these tubes are connected sections of pipe, that on C having a suitable mouthpiece.

In operation the vessel, A, is placed in the tank until filled with water through the valve. The lips are then applied to the mouthpiece on the tube, C, and air blown in. The effect of this, pressing on the surface of the water in A, is to close the valve in the bottom, when the water rises through D, and is forced out through the pipe thereto attached. The invention is small, is easily sent by mail, and is especially adapted to the parlor fountains which we illustrated a year or so ago. It is manufactured by the American Fountain Company, 6 Cortlandt street, New York city, whither inquiries for further particulars may be addressed.

How to Treat Frosted Plants.

A writer in *Inter-Ocean* says: "The disastrous effects which tender plants, which have become frozen, are subject to is generally known to cultivators; but how or why freezing produces the effect it does upon plant life is not so easily ascertained; and all attempts, heretofore made by scientific men to solve the question, have been, at most, only partially successful. In practical experience it is found that the length of time, and the degree of cold to which plants are exposed, affect them in proportion to the duration and intensity of these conditions, and these point, therefore, to the speedy restoration of a suitable temperature as the best means of restoring plants that have unfortunately been exposed to frosts. But the thawing out should, in all cases, be moderately gradual; and one of the best things to do, when plants have become frozen, either in the dwelling, conservatory, or open air, is to sprinkle the foliage with cold cistern or well water, as the temperature turns to rise. In the dwelling or conservatory, however, it will be necessary to start the fire in the stove, furnace, or flue, the first thing of all, to give the temperature an ascendancy; but it should, for several hours, not be allowed to rise above an ordinary suitable degree. Some advocate shading the plants from the sun and light for some length of time, but the policy of so doing has never been apparent to me, while I have frequently had proofs to the contrary; and the sun's rays, striking upon the plants with gradually increasing heat, in a great measure aid in their recovery. There is a great difference in plants as regards their ability to resist cold; and while some by the slightest frost will be injured beyond cure, others will bear various degrees, and even alternate freezing and thawing again and again, with impunity. Avoid handling plants in a frozen condition as much as possible, as the injury to them will be hightened should the leaves become bent or be roughly brushed over. To restore flowers that have become frozen, place them in cold water until the leaves are thawed out."

A Good Suggestion.

An excellent proposition has been made, which, if it be carried into action, will greatly add to the permanent value of the Centennial. In each county, provision should be made for the delivery of an address on the Fourth of July, tracing the history of that particular community during the past century or from the time when it was settled, and including a sketch of its growth, industry, resources, prospects, etc. These addresses, bound in some uniform style, as, for instance, that of Congressional reports, might thereafter be bound together by the States, and thus become of invaluable historical importance. The proposition is an admirable one, and should be carried out.

Automatic Locomotive Whistle.

Mr. L. S Ware, C. E., of Philadelphia, Pa., sends us diagrams and description of an automatic railway signal, designed to remedy the defective system now in use, which depends on the clearness of the atmosphere for its efficiency. It is the invention of M. Lartigue, electrician of the Chemin de Fer du Nord, of France, and of Mr. Forest, professor at the Ecole Centrale. It consists of a whistle on the locomotive, which is opened by an electro-magnet, the current being sent from a stationary battery, placed at some distance from the depot or junction which the signal is designed to protect. The device is conveniently and well arranged, but is not, we think, likely to supersede a simple lever on the engine operated by a lug near the rail, which device, we learn, has been tried successfully in England.

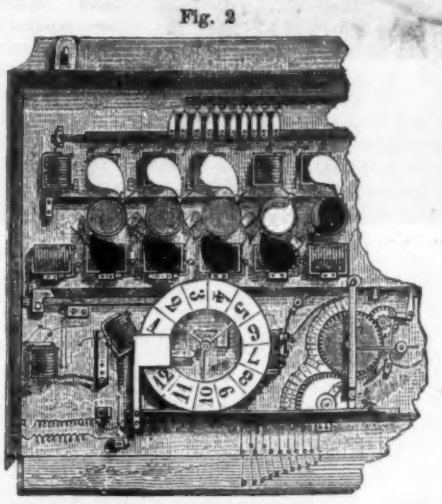
VOTING BY MACHINERY.

M. Martin, a noted French electrical engineer, whose numerous labors with regard to the electric light have resulted in his almost total blindness, has recently invented a curious apparatus for voting by machinery, the details and engravings of which we extract from *La Nature*.

The invention is intended to be used in legislative and similar assemblies, and it is so arranged that, on the question being put, each member has only to press a black or a white button in a box before him, according as he wishes to vote "no" or "yes," when one circle on a large indicator board appears of the corresponding color. The indicator is represented in our large engraving above each circle, on which places are prepared to receive the names of the voters. In case the member does not wish to vote, he presses both of his buttons, and the fact is noted by his circle appearing half black and half white

The interior mechanism of the indicator board is represented in Fig. 2. The electro-magnets above the circles operate so as to throw down the white screens, while similar magnets below the circle raise the black screens. Another ingenious feature is that the machine may be caused to instantly record the number of votes cast on each side. For this purpose two wheels are provided, each numbered on its sides with figures, up to the total of members of the assembly. Each wheel turns before a window in the indicator, which is just large enough to show the necessary figure. A lever moved by a weight describes a semicircle when the presiding officer touches a button placed before him, the effect of the last operation being to break a current. The lever carries a copper contact which travels over a distributor, and establishes a current whenever it passes before a circuit corresponding to a vote given. This current is transmitted to an electro-magnet, on the right for the positive and on the left for a negative vote, and the effect of the

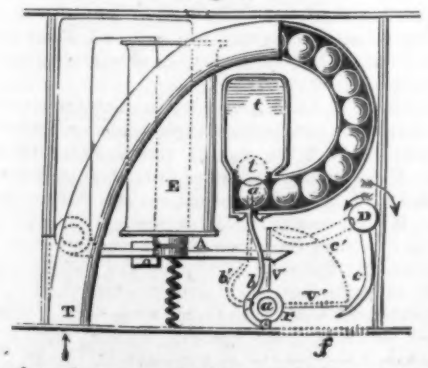
Fig. 2



magnet is to move the corresponding wheel as many figures ahead as the contact establishes circuits through the distributor. The result is shown at the windows marked 2 2 in the large illustration

There is also an arrangement whereby a record of the votes is made on paper. The electro-magnets which move the screens at the same time cause points to project, and

Fig. 3.



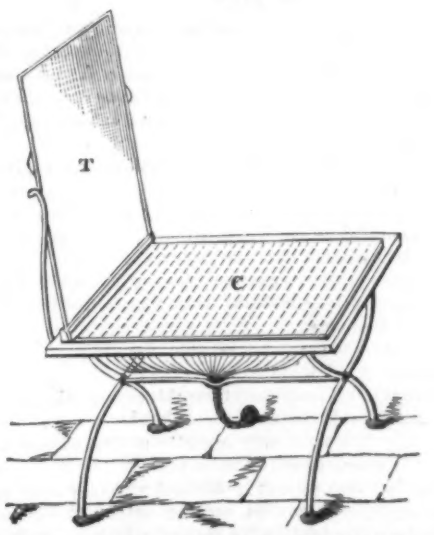
these, through some mechanism of which our cotemporary fails to convey an intelligible idea, mark upon a sheet of paper when the latter is pressed behind them. The sheet is previously prepared with the names of the voters at proper places, so that from the nature of the mark it is instantly seen how the individual voted.

By another system, invented by MM. Clérac and Guichenot, the whole assembly is enabled to see how the voting progresses, and each member can see, without leaving his seat, whether his vote has been received and registered. On each side of the tribune is placed a large slab, divided into as many compartments as there are members. One of these slabs is for the affirmative votes, and the other for the negative. On each member's desk are two knobs, one in electrical connection with the compartment on each slab which belongs to that member's seat.

Fig. 3 represents the interior of one of these divisions or compartments. It is composed (1) of an electro-magnet, E, whose armature, A, holds back a small shutter, V, of a gaudy color, and an arm, *b*, both fixed to and movable around the axis, *a*; (2) of an inclined tube, T, containing ivory balls, and whose lower end, *t*, pierced laterally, only allows one of these balls per vote to pass out; (3) of a cam, *c*, fitted into a shaft traversing all the compartments of the same vertical row; (4) a small window, *f*, looks toward the assembly.

When the member presses the knob—either "yea" or "nay"—before him at his desk, the electro-magnet attracts the armature, A, which releases the shutter, V, and which at at once—by means of a spring, *r*—shuts down in front of the window, *f*, so as to become visible to the member voting. At the same time the arm, *b*, obeying the impulse of the spring, *r*, pushes out a ball from the tube, T, into a vertical receiver, *t*, whence it arrives into a receptacle for all the balls from its corresponding frame. These various duties are accomplished, comparatively speaking, simultaneously in the different parts of the two frames, so that the whole of the voting is declared to the assembly by the appearance of the closed shutters, at the same time that its total value is

Fig. 4

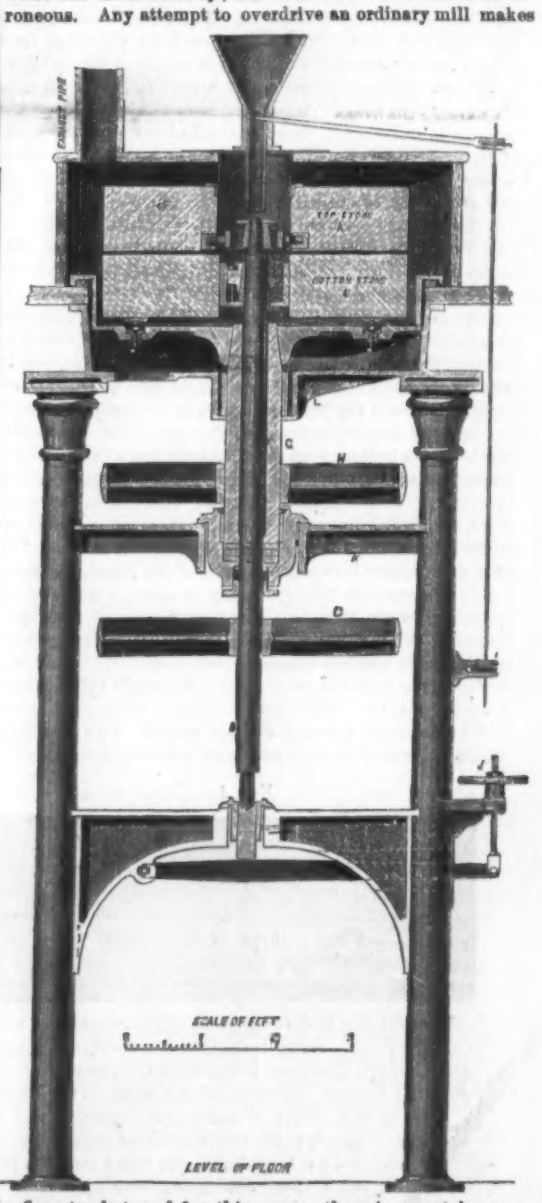


automatically declared by the final collecting tube graduated for the purpose. After the voting, the shutters and arms of all the compartments are restored by a single movement to their original position, by means of the vertical shafts, D, and the cams, *c*. The machine is then ready for a fresh vote. There are twenty ivory balls in the tube, T, which suffices for a sitting, and they are all exactly the same in size, and each bears either the name of a member or a number. When the numbering of the votes is accomplished, it merely suffices, after each ballot, to take away these balls and make up from them the list of voters. But the inventors have even done away with the necessity for this labor. The same electric current which has thus far worked the machine prints the name of the member and indicates the nature of his vote. Upon a metallic board, T, Fig. 4—prior to the voting—is a sheet of paper, sensitized by a salt easily decomposed by electricity (such as ferrocyanide of potassium); then this board is lowered upon a plate of hard caoutchouc, into which are embedded metallic pieces, each bearing the name of a deputy engraved upon it. Just as on the two frames, each member has allotted to him in this plate two metal pieces, the one in iron and the other in copper, communicating respectively with his "for" and "against" voting knobs. At the same moment, therefore, that the electric current drops a ball in either frame, it decomposes the salt on the prepared paper, and prints the member's name in red or blue, according as he votes "yea" or "nay."

IMPROVED MILL.

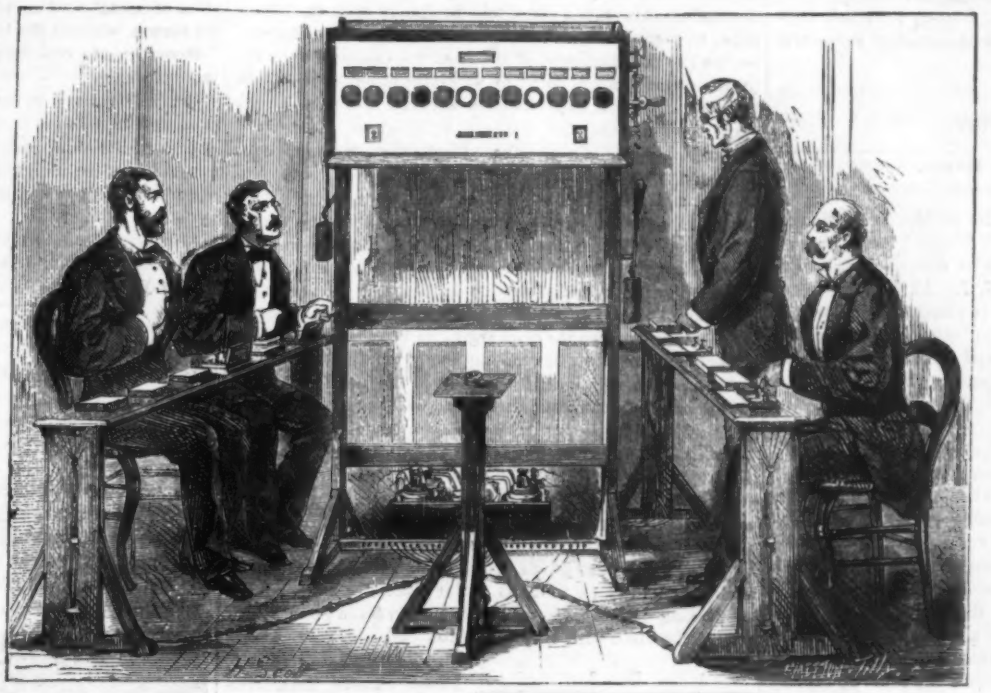
We illustrate herewith a novel system of grinding wheat, which deserves a good deal of attention. Very little description is necessary. It will be seen that the bed stone, instead of being fixed as usual, is set in a kind of frame or saucer, supported on a tubular shaft, and that this bed stone revolves in one direction while the runner revolves in the opposite way. At the first glance it would appear that there is very little in this. The remarkable feature is that, from evidence placed before us, we are left no room to doubt that a single pair of stones thus fitted will grind as nearly as may be three times as much wheat in a given time as a pair of millstones worked in the ordinary way. The stones are driven by two belts, one open and the other crossed. The top stone, A, is carried by the spindle, B, and driven by the pulley, C, while the bottom stone, E, is driven by the pulley, H. The hand wheel, I, regulates the feed, while J is used for adjusting the stone or tempering the grist. K is the footstep for the hollow spindle, fitted with friction plates.

The stones are driven at about the usual velocity, say, 108 to 113 revolutions. Now, at first sight it would appear that precisely the same results would ensue if the top stone of an ordinary mill were driven at twice the usual velocity; but this conclusion would be erroneous. Any attempt to overdrive an ordinary mill makes



the flour too hot, and for this reason there is a certain normal velocity which cannot be exceeded. In the mill now under consideration, although the relative velocity of the two stone faces is just twice as great as the normal velocity, there is no overheating whatever. The mill runs quite cool, and as we have said, brings down about three times the ordinary quantity of flour. The result seems to be brought

Fig. 1.—ELECTRIC APPARATUS FOR RECORDING VOTES.



about in the following way: When wheat is ground in the ordinary way, the centrifugal force and the angle of the cut in the stones forces the flour to the periphery across the face of the fixed stone; but in the improved mill, both stones being in motion, each helps the corn to the edge, and the corn consequently leaves the stones much more rapidly than it would do if one were at rest. In practice it is found that the speed of the stones may be brought up to 30 feet per second at the periphery, or say 127 revolutions per minute for a 4 feet 4 inch stone, without heating the flour.

The gear is the invention of Mr. Cullen, a British engineer, and has in practice been found thoroughly successful in every respect.

Correspondence.

The "Etheric" Force.

To the Editor of the Scientific American:

I have read with some interest the articles in the SCIENTIFIC AMERICAN on the so-called "etheric" force, in pursuit of which Mr. Edison is said to be now conducting experiments at his shop in Newark, N. J. At the same time, I cannot but believe that somebody is somewhere mistaken. Mr. Edison is perhaps sincere in his belief that he has discovered a new and valuable force, and if so he is deserving of credit for continuing his investigations; but he will soon learn, if he has not done so already, that the hopes excited are delusive and evanescent.

What has seemed to me most singular in the various published accounts is the statement, coupled with the fact that a spark is produced, that the force is apolic or non-polar. Inasmuch as there can be no such thing as an apolic or non-polar force, apolic meaning strictly neutral—and therefore anything that is apolic is incapable of manifestation as a force, manifestation involving force—hence anything apolic is not a force. The very fact that the force is manifested shows that it is either a positive or a negative condition at the instant of manifestation—by no means neutral; and your assumption, that one condition succeeds the other so rapidly as to prevent material manifestation in the galvanometer or other instrument, indicates to me your acceptance of this truth.

Some two years ago, I was considerably interested in this subject, and conducted a series of experiments at my laboratory, then in Washington, for the purpose of ascertaining whether the current could be utilized so as to effect a record or actuate a receiving instrument. So far was I from having discovered the force that I had learned its existence from others; and it seemed to me that, if it consisted purely of the molecular magnetic vibration, it might follow a metallic conductor in preference to running to earth, just as the magnetic force will extend from one end of an iron bar to the other, with equal facility, whether the bar is insulated or surrounded by other conductors, such as liquids. I soon became convinced of three things:

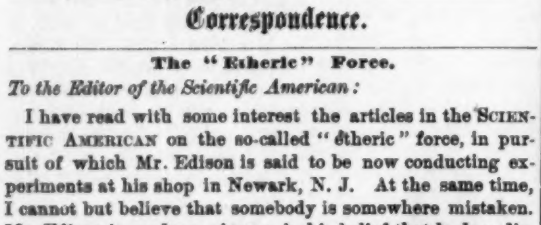
1. That the current can be made to produce a record.

2. That it is not purely the magnetic force, but what might be understood as the magneto-dynamic current.

3. That it is practically of no value.

I had in my possession a rather powerful magneto-electric machine, on the same principle as Ladd's machine. The revolving Siemens armature was wound with wire, which, starting with the slight resident magnetism in the electro-magnet between the poles of which the armature revolved, returned the induced current to the helices of the electro-magnet, thus building up the magnetic force in the electro-magnet, so that the induced current might be increased indefinitely. The machine produced the magneto-dynamic spark in great brilliancy. I witnessed, at times when the armature was revolving very rapidly, sparks of from $\frac{1}{4}$ to $\frac{1}{2}$ an inch in length between the poles of the magnet, although a carbon battery of 100 cups failed to indicate the least connection between the helices and the metal of the electro-magnet. When a piece of metal or a plate was interposed, it apparently became charged with electricity. The accumulation seemed to be in principle something akin to that of a Leyden jar, but it did not continue a sufficient length of time to produce a direct electric record. The manner in which I operated will be understood from the following:

Fig. 1.

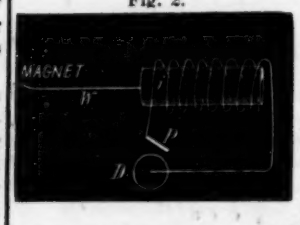


In the engraving is shown a plate electro-magnet, of which *m m* are the poles, curved inside for the revolving Siemens armature, which, however, is not shown. The iron projecting pieces, *h h*, were fastened to the ends of the cores in order to bring two points, *a* and *b*, near together, and thus afford a ready passage for the magneto-dynamic current. Between these, but not touching them, was a metallic plate, *c*, from which led a short conducting wire. At each half revolution of the armature, the piece or plate, *c*, became charged, and the charge extended to the second plate, *f*. Upon the plate, *f*, was a point, *d*, and whenever another plate, *g*, with a point, *e*, was brought in close proximity to the point, *d*, the third plate, *g*, also became charged; but here the spark was much weaker than at *c*. As near as I can understand it, this is practically what Mr. Edison has accomplished; and it really amounts to nothing at all. Nor did it seem to make any difference with the charging of the plate, *f*, when I placed the conducting wire in water; but it was observable that the plate, *g*, would also become charged from the water, although there the spark was very faint indeed, owing probably to the poorer conducting power of the water.

I of course tried all the suggestive experiments for producing a record, but could not do so directly. By placing moist litmus paper between the points, *a* and *b*, and covering the points with a thin, close chemical mixture affecting the litmus, it is true a mark was produced upon the litmus paper at every spark; but this was owing merely to the projection (by the discharge) of atoms of the chemical upon the litmus paper; and a spark of sufficient intensity would be impossible with a long distance between the poles of the magnet, even were this distance artificial and formed by means of a metallic conductor. In the same manner, paper saturated with a solution of ferrocyanide of potassium showed a faint mark, an atom of the points, *a* or *b*, being projected upon it by the discharge producing the spark. Both these experiments were naturally suggestive to me, I having many years ago discovered, or rather learned, that electric disruption, or the electric discharge, is the projection of an atom of the metallic or other conductor, and that, if the distance between the discharging and collecting points be not sufficient to allow of consumption or volatilization of the metal in its passage across, a portion of the metal will reach the opposite point in its natural state, and thus, by reason of chemical combination or decomposition, produce a record.

Entertaining at the outset the mistaken notion that the electricity thus developed is purely magnetic, or the magnetic circuit, or the molecular motion in which magnetism consists, I conceived the idea that, although itself incapable of producing a record when apart from the magnet, it could be converted, just as at the magnet itself, into dynamic electricity, and thus be brought under control. I carried the conducting wire to an iron plate in place of the plate, *f*, and wound the plate with very fine wire.

Fig. 2.



In the engraving (Fig. 2) I have omitted the electro-magnetic connections, *i* being the iron plate to which the magneto-dynamic current is conducted. This is wound with insulated wire, forming a closed circuit through the stylus, *p*, and drum, D. Over the drum runs chemically prepared paper. I may remark that, although I succeeded at times in producing a record, my tests were far from satisfactory, and many things combined to prevent my proceeding with the experiments at that time, the chief of which was my conviction that, even if carried to a successful conclusion, the results would be utterly valueless practically. Many other experiments, however, had been tried by me, involving convolvular wires, etc.; but they all came under the general rule of rejection. During my course of experiments, I tried electro-magnetic vibrators, similar to those in use on electric bells, and attached mechanical vibrators to the shaft of the magneto-electric machine, for the purpose of preventing the neutralization of the positive spark force by a succeeding negative, and with some success; but everything pointed to the conclusion set forth above.

Without criticizing Mr. Edison's taste, as an electrician, in selecting the name "etheric force" to designate the observed electric current (I think Mr. Keely calls his tremendous and unapproachable force by the same name), I wish to point out some features in the published accounts which may lead to serious errors of judgment.

Primarily, it was stated that Mr. Edison was led, from the unusual brilliancy of the spark he accidentally observed, to suspect that it was due to something more than induction This cannot be as stated. Mr. Edison could not have suspected such a thing from the phenomena observed, or for the reason alleged, for he could not have witnessed in any of his experiments a more brilliant spark than that of the inductive or static discharge.

Secondly, the spark has no lack of polarity.

Thirdly, it is not indifferent to the earth.

Fourthly, it is practically incapable of transmission through any considerable length of uninsulated wire.

Fifthly, it is practically incapable of transmission through a city by means of gas or water pipes.*

The fact that a spark is obtained when the wire is turned back upon itself proves nothing beyond the general law that electricity prefers the shortest circuit.

Fig. 3.

This will be understood from the above engraving (Fig. 3), in which the wire coming from the magnet is shown turned back upon itself at *p*. Being static, dynamic, or magneto-dynamic, the current would naturally cross the space by the metal or person, *a*, from the point, *p*, to the wire instead of traversing the larger circuit of the dotted loop. This may be tested by any person having a good induction coil, when, if rightly connected, he will observe a spark pass from the point, *p*, to the wire, or *vice versâ*, although there is a good metallic connection by the dotted loop. In this respect, clearly nothing whatever has been shown.

The seeming lack, in the "etheric" force, of physiological effects, is really of no more moment than the seeming lack of physiological effects when a person, upon holding a finger in proximity to one of the ends of the secondary wire of a low induction coil, witnesses the passage of sparks without experiencing physical sensations I have often stood with a constant stream of sparks passing between my hand and a piece of metal and an electrode, the whole passing through my person, without the least physical knowledge of the fact.

Permit me to conclude with the following statement and propositions:

When I first saw in the press the accounts of Mr. Edison's experiments, two questions naturally arose:

Will an inventor, really believing that he has discovered something of value, give the public the advantage of his researches until such time as he shall have secured himself by letters patent?

Does Mr. Edison declare, over his signature, that he considers the "etheric" force to be of any value?

New York city. W. E. SAWYER.

*There is no adequate evidence, as yet, that the force has ever in any degree been so transmitted.

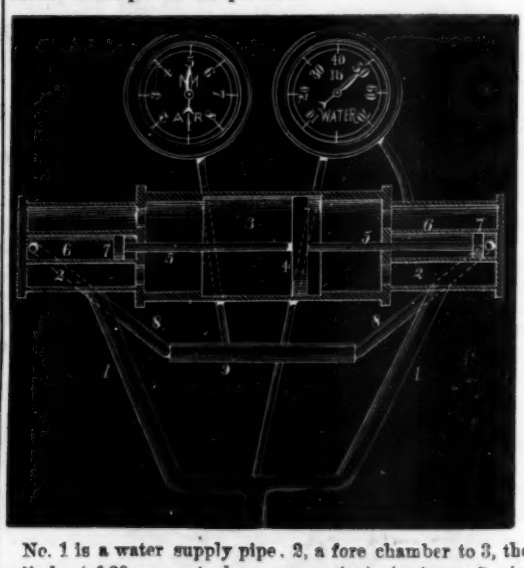
The Hydro-Pneumatic Puzzle.

To the Editor of the Scientific American:

In No. 23 of your last volume, I find an article headed "Keely out-Keelied, or the Hydro-Pneumatic Puzzle," with a challenge to your readers to solve the mystery. I offer, therefore, the following as a possible solution:

In the accompanying drawing I have confined myself to the solution of the problem, and I have left out several parts which appear on the original engraving, as I desire to show only the arrangement necessary to create the necessary pressure to act on the gage.

It seems that some parts of the original were put in by the maker to complicate the problem.



No. 1 is a water supply pipe. 2, a fore chamber to 3, the cylinder (of 20 square inches cross section); 4, piston; 5, piston rod, with 7, a small piston (1 inch cross section) connected to it. No. 6 is an air cylinder; 8, air pipe; 9, prolongation of air pipe, or, if necessary, a cylinder for converting the power produced into motion.

This arrangement might be called a hydro-pneumatic lever, as it is but a translation of power, and so, I believe, is the "Hydro-Pneumatic Puzzle."

If a stream of water of 50 lbs. pressure is let into pipe No. 1, the full pressure, bearing on the piston, the piston rod, and the small 1 inch piston in the air cylinder, 6, would be $50 \times 20 = 1{,}000$ lbs.; and (allowing for the elasticity of air) that amount, more or less, will be indicated, through the connecting pipes.

I have left out the waste exhaust pipes, and the valves, as they are unnecessary to explain my idea.

Syracuse, N. Y. CHARLES KRONMEYER.

Through the Hoosac Tunnel.

To the Editor of the Scientific American:

A late train landed myself and a friend about dusk, at North Adams, a few days since, for a brief pastime in the region of the great tunnel.

The village of North Adams is situated, apparently, at the extreme northerly angle of a vast recess or niche in the Hoosac mountain, through the easterly side of which the tunnel runs. There are now two trains daily through the tunnel, one at 6 A. M. from the west and one at 6.30 P. M. from the east. We had resolved to foot it through the tunnel, following the six o'clock train, provided we found it safe to do so, knowing that the work of blasting and arching was still going on inside. After an early breakfast next morning, we proceeded directly up the track towards the mouth of the tunnel, inquiring, of the first man we met, whether it was customary for visitors to walk through the tunnel? He said that parties of a dozen or more sometimes went through, but that it was not exactly safe for one or two, as there were some hard customers at work in there. Surely there was a scare for us, of a quite different nature from what we had anticipated. Instead of nitroglycerin, falling rocks, midnight darkness, perennial showers, it was highway robbery; but thinking the scare might have been intended for our personal benefit, and not being very richly endowed with gold watches and greenbacks, we did not turn back, but bent our steps towards a primitive grocery store on the bluff ahe,da

for the purpose of sounding the storekeeper as to the feasibility of walking through the tunnel, and as to hard customers in particular. He did not "know about hard customers, but you cannot get through the tunnel today, for a large mass of rock fell last night, and the train cannot get through this morning." "But perhaps we can walk through?" "Well, you can try it, but I would not insure your safety." We tried it. Procuring a miner's lamp, which resembled a diminutive coffee pot, with a wick in its snout and a large fish hook for its handle, we were soon within the yawning portal,

"Leading to gloomy arches,
"Where the June sun ne'er is seen,"

and traversing the weird solitude of the Hoosac Tunnel.

A massive arch of stone masonry, of comely design, forms the westerly portal; brick and cement arching extends from this far beyond the reach of frost and daylight. A leisurely walk of about one hour (escaping several brief showers by dodging from the railway sleepers to the curbing of the central drain, and *vice versâ*) brought us to the sound of workmen ahead. Up to this point, darkness and silence, save our own voices and feeble lamplight, had prevailed, the stillness being broken by the faint music of water trickling from above and flowing copiously along the central drain towards the westerly portal. Here we were saluted by two blasts some rods ahead, sharp and terrific, like claps of thunder, which made old Hoosac tremble. Lamps began to multiply, and the aspect ahead was soon changed from utter darkness to that of a section of an illuminated street on a dark night. The numerous lamps moving hither and thither, the glow of several forges in full blast, together with the ceaseless din of the hammers, anvils, drills, and trowels of one hundred and sixty workmen, rendered the scene and sensation at once novel, strange, and exciting. We soon came upon the mass of rock and *débris* which fell in the previous night, and which prevented the passing of the cars that morning. It was a huge pile, and would probably require the entire day for its removal, to allow the train to pass. In getting over this obstruction, my friend managed to blunder into the central drain; but as the water was but little above his knees, his agility saved him from much wetting and discomfort. The work now in hand here consists of dislodging a large amount of rock, pronounced unsafe by the judges, and filling up the recesses thus formed with brick and cement arch work. This job is chiefly west of the central shaft, and is swallowing up a vast amount of brick and cement. As we advanced, we soon passed the central shaft, which appeared to be nearly closed up with timber. The air soon became stationary: up to this point we had noticed a decided current from the west, but it gradually diminished, and what seemed to be a compound of smoke and fog now increased in density. The darkness and silence soon became profound.

One hour and twenty minutes more of this most strange experience found us nearing the easterly portal: here the smoke and fog were so dense that daylight could scarcely be discerned five rods before we emerged into the outer world. The easterly half of the tunnel is comparatively dry. Its arching is of Nature's own masonry, and the easterly portal is fringed with Nature's own handiwork, which apparently will stand till old Hoosac shall be riven.

Let the reader cast his eye upon some object five miles away, and then imagine an underground passage twenty-six feet in diameter from beneath his feet to that object, and he may have some conception of the extent of this vast excavation. Or let him take a piece of No. 16 wire (the size of a small knitting needle) five feet long, make it perfectly straight and level, then elevate its center about one eighth of an inch for the grade of the tunnel; then erect a piece of similar wire, three inches long, upon the center of the long one for the central shaft, and he will have a good model and a comprehensive idea of the proportions of this notable work.

Worcester, Mass. F. G. WOODWARD.

Carbonic Acid as a Preventive of Decay.

To the Editor of the Scientific American:

In September, 1868, I had occasion to be at the Avondale mines shortly after the shafting and brake were destroyed by fire, causing over one hundred persons to be smothered to death, all means of escape being cut off. On the fourth day after the disaster, the bodies were reached and brought to the surface. On inspection, I noticed that they did not present the appearance of being dead. The looks on the faces were natural, and the skin soft and pliable and of a pinkish or flesh-tinted hue; the limbs were limber and movable. No blackness or discoloration was visible.

In trying to account for this condition, I was led to reflect as to what might be the cause which checked these bodies from decay; and I could only attribute the effect to the conflagration, which made large quantities of carbonic acid gas: which, being heavier than air, filled the mine entirely, excluding the atmosphere and preventing its oxygen reaching the bodies: thus protecting the animal substances from change

I afterwards tried by actual experiment if my idea was right, and I found, to my entire satisfaction, that if any animal or vegetable body was placed in an airtight vessel, and the atmospheric air excluded, its place being supplied by pure carbonic acid gas, it will keep without any sign of decay or change so long as it is kept hermetically closed. I have not the least doubt that, by the proper construction of large metallic vessels or tanks, made perfectly airtight, animal and vegetable bodies placed in such receptacles (all air being drawn out and pure carbonic acid gas forced into its place under pressure) could be transported to great distances and kept for a long period without any loss by decay. By the use of said gas, I think, dead bodies could be kept in a properly constructed case, thus obviating the use of ice. Medical colleges could use it to keep subjects from putrefaction, and do away with the use of alcohol, thus lessening expense and giving better specimens for dissection.

Wilkesbarre, Pa. C. W. S.

A Worm in a Horse's Corn.

To the Editor of the Scientific American:

I desire to give you a piece of my experience in horse-shoeing. Not long since, a horse was brought to me to be cured of a corn in the foot. In paring the corn, I found a worm about ⅜ inch long, ⅛ inch thick, and sharp at each end as a needle point. One end was black and the other white. The black end was next the sole of the foot and the white end in the flesh. After removing the worm, and burning with nitric acid, the corn was entirely removed, and the horse permaturely cured of lameness, with which he had been troubled for some time. D. O. W.

Carrollton, Ky.

The Cheapest Microscope.

To the Editor of the Scientific American:

Inclosed please find a simple little instrument of my invention, which, although of very insignificant appearance, is nevertheless, by the addition of a small drop of pure glycerin, converted into a wonderful little microscope of great power.

By means of the point of a fine needle, insert a small quantity of pure glycerin in each of the holes in the little strips

of brass; on withdrawing the needle, there will remain two perfect double convex lenses, one in each hole. Use one of the lenses as a receptacle for any minute object which you wish to examine; hold the instrument, with the other lens very near to the eye, between the thumb and finger, and adjust the focus by a gentle pressure.

Loda, Ill. HORACE C. DEAN.

Boil it Down.

[It is not often that we print poetry, but the following verses contain such good advice, to writers for the press and others, that we transfer them to our columns for the benefit of our readers and ourselves.

No editor likes to print very long articles; no reader likes to read them; and correspondents will do well to take the advice of our poet, and be brief. Condense and re-condense your copy; write with ink; state your inquiries briefly; communicate what you have to say without a prolix preface stating the great length of time you have been a subscriber, how greatly you prize the paper, etc., but come right to the point and state your wishes tersely. We are glad to receive suggestions, answer inquiries, and give written opinions on the patentability of any invention, and to publish correspondence on any subjects of interest which are appropriate to our paper.]

Whatever you may have to say, my friend,
Whether witty, or grave, or gay,
Condense it as much as ever you can;
Say it in the readiest way;
And whether you write of household affairs
Or particular things in town,
Just take a word of friendly advice:
Boil it down!

For if you go spluttering over a page,
When a couple of lines would do,
Your butter is spread so much, you see,
That the bread looks plainly through.
So when you have a story to tell,
And would like a little renown,
To make quite sure of your wish, my friend,
Boil it down

When writing an article for the press,
Whether prose or verse, just try
To utter your thoughts in the fewest words,
And let them be crisp and dry:
And when it is finished, and you suppose
It is done exactly brown,
Just look it over once more, and then
Boil it down.

Liability of Palace Car Companies.

A case involving the liability of palace, drawing room, and sleeping car companies, was recently tested before a court in the State of New York. A passenger took a berth in a Pullman car from Detroit to Buffalo. Upon retiring, he placed his overcoat in a vacant berth over that in which he slept. In the morning the coat was missing, and diligent search failed to recover it. Evidently it had been stolen, and the passenger brought suit against the Pullman Palace Car Company to recover its value. The court held that the company was not liable. The judge who delivered the opinion said, among other things: "It is sought to charge the company with the responsibility of the innkeeper, upon the assumption that the law implied a contract or, imposed a liability of the same nature; that responsibility was declared by the civil law to be as strict and severe as that of common carriers, and modern jurisprudence has adopted and applied the principle. But it went no farther, as is sought to be done in this case. He cannot lawfully refuse to receive guests to the extent of his reasonable accommodations, nor can he impose unreasonable terms upon them. The necessities of the traveler require these just rules to be adopted. As a compensation for the responsibility thus incurred, he has a lien upon all the property of the guest at the inn for all his expenses there. There are no facts in this case justifying the application of such rules of law. The company could not be compelled to receive and entertain passengers, however amenable it might be upon its contract with the carrier, and had no lien for the price of accommodations. The traveler voluntarily, and not of necessity availed himself of what was placed before him for his comfort, and he cannot cast the burden of care and diligence upon the defendant; neither is it right or just that the law should do so."

Decomposition of Products of Sewage.

Popoff has investigated the phenomena attending the spontaneous decomposition of a slimy mass taken from the mouth of a street sewer where it discharged into the river. It contained every possible sort of kitchen refuse, as well as other organic matter in an advanced stage of decay. It was of the consistence of pap, had a dirty gray appearance, and a reaction neutral or scarcely perceptibly alkaline, and emitted a peculiar odor. Flasks were filled with this matter, somewhat diluted, and the gas given off was examined at intervals of two to four days. One sample gave off the following amount of gases within 3½ weeks:

	Carbonic acid.	Marsh gas.	Oxygen.	Nitrogen.
A	11·75	2·48	4·71	81·06
B	34·99	29·03	0	35 98
C	55·81	43·54	0	1·65
D	56·00	42·70	0	1·30
E	45·90	54·10	0	0·00
F	43·30	56·60	0	0·10

At first the enclosed air lost its oxygen, and there remained merely a mixture of carbonic acid and marsh gas (CH_4); at first the carbonic acid preponderated, afterwards the marsh gas.

The slime consisted of (in addition to some amorphous inorganic matter and numerous crystals of carbonates) cellulose and a large number of pigment bacteria, among which the red and yellow predominated; then the green and other forms of zoöglœa. These organisms were already present in the decomposing mass in large quantities, and increased so prodigiously, by long continued putrefaction, that it was easy for the unaided eye to recognize them from the red and green colors. This very considerable increase of the bacteria, which kept pace with the production of carbonic acid and marsh gas, permits us to recognize the reciprocal relation. Careful observation of the temperature within a flask, as compared with the air outside, showed that the heat in the flask was always greater. At the beginning the difference was slight, from 0·36° to 0·72° Fah.; at the close of the second month, the difference had increased to 0·8° and 1·0°. This production of heat in the putrefying substance, which could be detected in spite of the heat continually rendered latent by the developed gases, makes this operation analogous to alcoholic fermentation.

As in fermentation, so too in the production of marsh gas, the temperature has an important effect. The evolution of marsh gas was observed at different temperatures, which remained constant during the experiment, from 42 8° to 164° Fah., and it was found that the production of marsh gas increased very strikingly with a rise of temperature. The greatest evolution of gas was observed at 128° Fah.; from 118° upward it decreased, and ceased entirely at 122° to 131° Fah. Masses of this slime, which had been heated for one or two hours up to 275°, 230°, 212°, 167°, 127·4° Fah., so as to kill the bacteria, evolved no gas at all. On the other hand, a mass which had been frozen was just as capable of fermentation after it was thawed out, as that which had not been frozen. The composition of the gases evolved at various temperatures only differed in this, that at higher temperatures the marsh gas very soon began to predominate over the carbonic acid, while at lower temperatures this required a longer time.

Another analogy between the evolution of marsh gas and other forms of fermentation is found in the circumstance that such substances as the cyanide of potassium, quinine, chloroform, carbolic acid, etc., which check fermentation, also check the production of marsh gas.

Further experiments prove that, in the decay of cellulose, marsh gas is the chief product formed. Hence it is clear why marsh gas appears in Nature in places where large quantities of vegetable remains, which consist chiefly of cellulose, are heaped up, as in swamps and bogs, on river banks, in coal mines, etc., where the decomposition of cellulose takes place on a large scale. In this way, too, may be explained the fact that marsh gas is often evolved in the alimentary canal of man and the higher orders of animals.

Pumping Water Directly into Mains.

We recently published a communication calling attention to the water works at Ross in England, which anticipate an essential part of the well known Holly system in use in many parts of this country. Mr. T. C. Lewis, of Portsmouth, Vt., now writes to say that a similar plan has been in use in Bellefonte, Pa., ever since the year 1815. The water, from the spring that turns the wheel to supply power for pumping, is forced into the mains and is there kept constantly under pressure.

Mr. J. A. Richardson, of New York city, says that Mr. Holly's patent disclaims the idea that there is any novelty in furnishing water in limited quantities for ordinary use by means of forcing pumps, or in the use of stationary pumps for extinguishing fires; but that the Holly invention consists in effecting these two objects by a single apparatus.

IMPROVED STILL COLUMN.

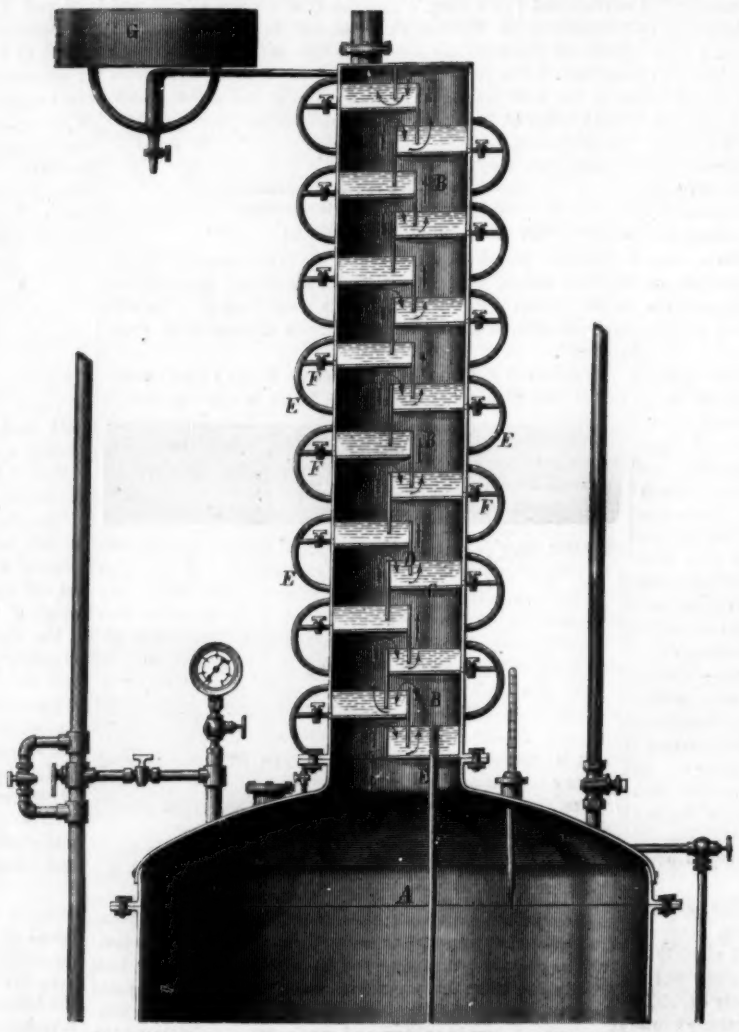
We illustrate herewith an improved column for refining stills, which is designed to take the place of the so-called French column, now in common use. The practical working of the invention is the same as that of the French column, but its mechanical construction, as will be seen from the following description, is entirely different, and it is claimed to possess many advantages. The apparatus may be located in one story of ten feet in hight, instead of requiring three stories twenty five feet high, thus effecting a large saving in room and copper plates. Easy access may be had to the interior, for making repairs; leakage is prevented, and a finer spirit is produced with less steam pressure. The essential feature in the device is the arrangement of the chambers, which, instead of being placed vertically one above the other, are situated side by side, as shown in the engraving.

A is the common refining copper still, above which is located the column in which the chambers, B, are formed by semicircular horizontal plates, C, extending alternately from opposite sides, and by vertical partition plates, D, near the center. Between the partitions, D, small spaces are left in order to establish communication between the chambers. Overflow pipes, E, at both sides of the column connect the chambers of each series, and gradually convey the exhausted liquor back into the still, A. Near the bottom of each chamber is a drain pipe, F, provided with a suitable stopcock, which communicates with the overflow pipes so as to allow of the easy emptying of the chambers for cleansing, etc. The overflow pipe from the lowest chamber passes directly into the still.

The operation is as follows: After being filled with liquor the still is heated. The alcoholic vapors are quickly eliminated and pass over the first vertical partition, D, into the lowest chamber, striking against the adjoining partition plate of the next chamber above. The vapors are then forced through the liquor in the lowest chamber, and thence pass up from chamber to chamber, gathering additional strength from the contents of each, until they reach the goose condenser, G, where partial condensation occurs, and the vapors are returned to the uppermost chamber of the column. The strongest vapor passes over to the worm, and, being condensed to liquid form, is drawn off at the tail of the latter. The liquor falls from the highest chamber to the next below, and so on, until the bottom of the still is reached through the overflow pipe of the lower chamber being completely exhausted of alcohol.

It will be seen that the intercommunicating arrangement of the chambers virtually produce two columns in one. All the overflow pipes are at the outside, and thus are very easily repaired. The cost of the apparatus, the inventor states, is reduced to one half that of the French column, while the operation of the device, as he has proved by practical experience, is such as to produce quicker and better results.

Patented through the Scientific American Patent Agency, November 16, 1875. For further particulars address Mr. Edward Melchers, 103 Monroe street, Toledo, Ohio.



DEYMANN AND MELCHERS STILL COLUMN.

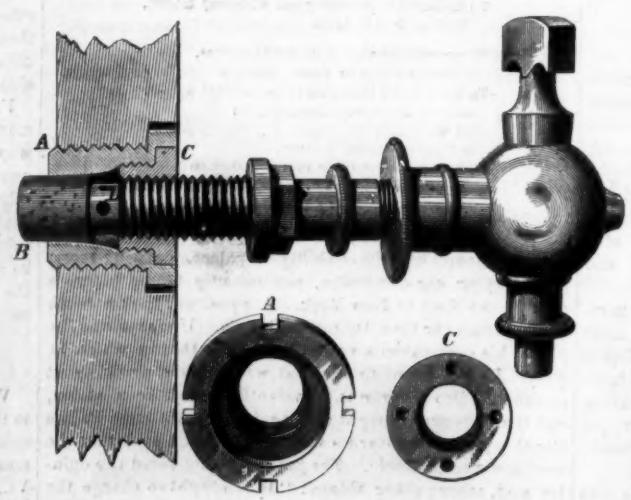
IMPROVED BARREL FAUCET BUSHING.

We illustrate herewith a new faucet bushing for beer or other barrels, which, while firmly holding a cork or stopper, allows of the same being pushed inward on the faucet being inserted, without any leakage. The exterior of the device shows a perfectly flat surface adapted for the reception of the tax stamp, which the introduction of the faucet necessarily tears and cancels.

The thimble, A, has a flange provided with suitable apertures, through which the securing screws may be inserted, and also an external screw thread which attaches it to the barrel. B is a plug fitted to close the inner end and to prevent the escape of the liquid during transportation. C is a tubular nut or second thimble, having both an internal and external screw thread, the latter permitting it to be attached to the internally threaded outer portion of the thimble, A, thus acting to prevent the cork from being forced outward. The internal screw thread gives a means of attachment of the faucet as shown. The nut, C, has a flange on its outer end, which is let into a countersink in the thimble, A, so that, when the parts are in place, a flat exterior surface is afforded.

The entering faucet shank forces the plug, B, out of the bushing, and the liquid then escapes through the openings, at D, at the end of said shank. The lateral apertures also permit of the passage of the fluid, should the plug remain over the inner end of the bushing. The invention is claimed to fit more tightly and to be less expensive than the similar devices commonly employed It will prove of much convenience to grocers, liquor dealers, apothecaries, and others.

Patented December 8, 1874. For further information address the inventor, J. F. Mantey, Industry, Austin county, Texas.



MANTEY'S BARREL FAUCET BUSHING.

A Hint to Young Mechanics.

Two things are uppermost in almost every industrious young man's mind, the desire to make and save money, and to be established in business for himself. Now as an encouragement to persevere in that industry, also in faithfulness, close attention to business, and also in improvement of the mind, we suggest that a few dollars placed at interest will grow in amount wonderfully fast, if the interest is also invested and a few dollars regularly added to it. The evenings usually spent in idle ways, if devoted to scientific, practical books and papers, will, in a few years, make a young man educated and prepare him for directing an establishment of his own. Remember it is the most skillful, artistic, and finished workman that rises above his fellows. When you have mastered your trade and find your mind stored with useful hints and thoroughly scientific knowledge, then turn to a partnership or part interest in business with your employers. Your standing and the little capital saved will help you wonderfully. If such a part interest is not practicable, select another industrious co-laborer and commence in a one story, one roomed office, with a particular specialty of which you are thorough masters. Push to completion in perfect workmanship such small orders as you can persuade the public to extend to you. Remember that personal application, integrity, and industry will in a few years bring their reward. They always have and they always will.—*Mechanical Journal.*

A GOOD bronze for ball valves, and for pieces to be brazed is made of copper 87 parts, tin 12, antimony 1.

The Manufacture of Rough Leather.

There is no good reason why female hides should be purged of their gelatin, while those of the male are plumped by all the methods known to the tanner's art. The practical tanner may urge that the female hide is intended for upper, while that of the male is used for sole and belt leather, and (when used for these purposes) he may insist that itshould be treated in the manner indicated. But this assumes a necessity which it is our purpose to dispute.

In all the countries of Southern Europe, the full grown cow hides are manufactured into sole leather; indeed, with the exception of the ox and steer hides brought from South America, the whole supply of sole leather in those countries comes from their cowhides, for they do not raise oxen, but use cows, both as beasts of burden and also to supply the food of the people. This fact shows that cowhides, when properly manufactured, may serve a very useful purpose for sole leather. Besides, it is conceded that cow hides do make a finer-textured leather than ox hides, and they are largely used in the manufacture of "union crop" leather, thus making a large proportion of the finest sole leather for women's and children's shoes. Until within a few years, a greater part of the finer grades of women's shoe leather was thus made from cow hides. When, therefore, female hides, either in France, Germany, or the United States, are used for sole leather purposes, the tanner finds no difficulty in suitably plumping them, and in making weights which approximate those made from steer or ox hides.

The practical and important economic problem, therefore, arises, whether our tanners are justified in purging and depleting these valuable pelts down to an upper leather substance, even conceding that such a process does make good tough stock. We say: No. We insist that such a tannage is wasteful, and should be abandoned. The boot and pebble grain leather manufacturers have adopted a system of expanding the fiber and plumping the substance, which overcomes, to a great extent, the waste here referred to. These manufacturers long since learned that they could not get a round, plump, firm, and fixed grain on a leather depleted in the bath, and tanned with weak, sour liquor. The grain and fiber were too soft and yielding to furnish a grain leather that would hold the impression made by the board or the die. This defect induced the Woburn tanners, long ago, to prepare leather specially for their grain and buff purposes. This special method was confined to that section of Massachusetts for several years, but has now extended to all manufacturers of this description of leather in the country. It consists in suspending the sides in liquor, and tanning them while in this position.

The Woburn tanners tacked the sides on frames, and still continue that practice, as far as we are advised, but many other tanners merely suspend the sides over sticks, and agitate the liquor, either by rocking the sides on frames or plunging them into the liquor, by hand or other power. By either method the same result is reached. The side is plumped in shoulder and offal, and a smooth, round grain is formed, which takes a lasting impression, These qualities add so materially to the economic value of the stock in cutting, whether for shoe or bag purposes, that ordinary upper leather tannage is driven out of competition, and is now seldom used except when, as at present, oak rough tannages are held in excess, and are selling at a loss of three or four cents per pound.

There can be no doubt that boot grain, made from a depleted tannage, will crimp and possibly wear better than leather raised and tanned as above described; but when enough of the fiber is retained with the grain, as is the case where an eight or even a six ounce substance is retained, then it is very doubtful whether the old-fashioned tannage presents any advantages over the new. The case is, however, far different where these raised tannages are split down to a light grain or buff substance. In some of these goods, little more than the grain itself is retained, while the great bulk of the fiber is split off and goes into trunk and carriage leather. We need not dwell on this practice, nor insist on its damaging effect on the trade.

The custom of coloring and partially tanning on frames suspended in the liquor has improved of late the union crop tannages almost beyond conception. This improvement consists in plumping and making fine the bellies, shoulders, and pates. We assume similar advantages would result to the hemlock and oak rough leather tannages if thus carried on. There is no more difficult task than to find oak rough leather suitable for fine harness and bridle purposes, and much of this difficulty arises from this deficiency of plumpness and fineness in the shoulders and offal. If oak rough leather tanners will adopt our suggestion, and color and partially tan their stock in a suspended state, they will at once overcome this difficulty, and improve the durability as well as the appearance of their oak rough leather.—*Shoe and Leather Reporter.*

THE JAGUARS.

The jaguar (*felis onca*) is the largest of the carnivora found on either of the American continents; and its size, strength, and ferocity are such that it is often called the South American tiger. It is found both in North and South America, generally between the tropics, and as far north as the Red River, La.; and the larger specimens are but little smaller than the average tiger of Asia. The hight at the shoulder is frequently nearly three feet. The skin is beautifully marked with black circles enclosing grayish spots, on a ground color varying from light brown to ashy yellow; but the configuration of the marks varies widely on different specimens, and sometimes even on the same animal. Humboldt states that 2,000 jaguar skins are annually exported from Buenos Ayres, and they are much valued for their beauty.

The habitat of the jaguar is generally a thick forest, especially in the neighborhood of a river, as the animal swims well, and will catch fish for its meals when flesh is scarce. When driven by hunger, it does not hesitate to visit the abodes of man, and its strength enables it to kill and carry off a horse or a cow with ease. Its favorite mode of attack is to leap on the victim's back, and, by placing one paw on the head and the other on the muzzle, to suddenly break its neck. It, however, rarely attacks man, and then its hunger and ferocity are such as to make it terrible. It is very fond of turtles, and extracts the flesh from the shell with great skill.

A recent writer asserts that the variation of the marks on the skin of the jaguar is due to climatic influences, the species being found over territory ranging from 32° south latitude to 25° north, from the Argentine Republic to Texas. Like its Asiatic cousin the tiger, the jaguar cannot be tamed, long confinement, ample food, and kind treatment doing nothing to check its ferocity. It is therefore a constant source of alarm to the neighborhood where it lives, which alarm is not diminished by the fact that its predatory excursions are always made at night. It is exceedingly subtle, approaching its prey noiselessly, and walking behind bushes or other screens till near enough for action; it then makes some slight noise with its tail, which alarms the victim and seldom fails to induce him to move to find the cause of the disturbance. The jaguar then springs on the neck of the prey, tears the throat to pieces (or breaks the neck, as above described), and carries off some portion of the carcass; next day it will probably return for another meal, and this gives an opportunity of tracking the beast to his lair. But although the jaguars are numerous in the region which we have mentioned as their home, their sagacity enables them to keep well concealed and out of the range of the rifle.

The family group depicted in our illustration is now in the Zoölogical Gardens, Cologne, Germany, and the specimens are of great beauty. Jaguars are also to be seen in the Zoölogical Gardens in London and in Amsterdam, and others were, and probably now are, in the Jardin des Plantes in Paris.

The Manufacture of Lubricating Oils.

The records of the Patent Office contain almost the only description of the improvements that have been made in the manufacture of lubricating oils. These records are inaccessible to the great majority of people, but they are of great value to any who are interested in the manufacture of oils, frequently containing suggestions that lead to other discoveries and to valuable improvements. We give below descriptions of two improvements in lubricants, which the *American Manufacturer*, of Pittsburgh, Pa., has compiled from the Patent Office records.

The first invention consists in a compound of residuum formed from the distillation of petroleum oil, Carolina tar, and petroleum, or any liquid fatty substance for producing a cheap and durable lubricating oil that will not gum in using. The function of this residuum is to give body and consistence to the compound. The Carolina tar contains an acid, and separates all granulous substances which are injurious to the lubricating qualities of the oil. The introduction of petroleum oil is to reduce the compound to a proper gravity.

To prepare the oil, take the following relative proportion of the above ingredients, the quantity of each being proportionately increased or diminished, according to the aggregate quantity of the compound desired: To about 1,600 gallons of the residuum, add about 150 gallons of Carolina tar, and boil them together in a tank with steam heat for about 6 hours; then turn off the heat and let it settle for 6 hours; then draw it off into another tank and add a sufficient quantity of petroleum or other liquid oils to reduce the mixture to a proper gravity for lubricating purposes. The proportion of Carolina tar to the above quantity of residuum may vary 20 gallons either way; but the relative quantities stated are found to best answer the purposes of manufacture.

The second invention consists in a lubricating compound made of mineral oil, plumbago, flowers of sulphur, and soapstone, to which may be added tallow, rock salt, and palm oil, in such a manner that the plumbago and soapstone act as vehicles to distribute the lubricating material, while the flowers of sulphur and the rock salt act particularly as coolers.

In carrying out this invention, mix the ingredients in the following proportions: Mineral oil, 4 lbs., 7 ozs.; plumbago, 10 ozs.; flowers of sulphur, 8 ozs.; soapstone, 4 lbs., 7 ozs. It will in some instances be found desirable to increase the body of such compound, and in such to have present a cooling agent, and to provide for such, to employ, in connection with the aforesaid ingredients, tallow, palm oil, and rock salt, and under such conditions that good results are produced when the proportions are made: Mineral oil, 3 lbs.; tallow, 2 lbs.; plumbago, 4 ozs.; rock salt, 4 ozs.; palm oil, 4 ozs.; flowers of sulphur, 2 ozs.; soapstone, 4 lbs., 2 ozs.

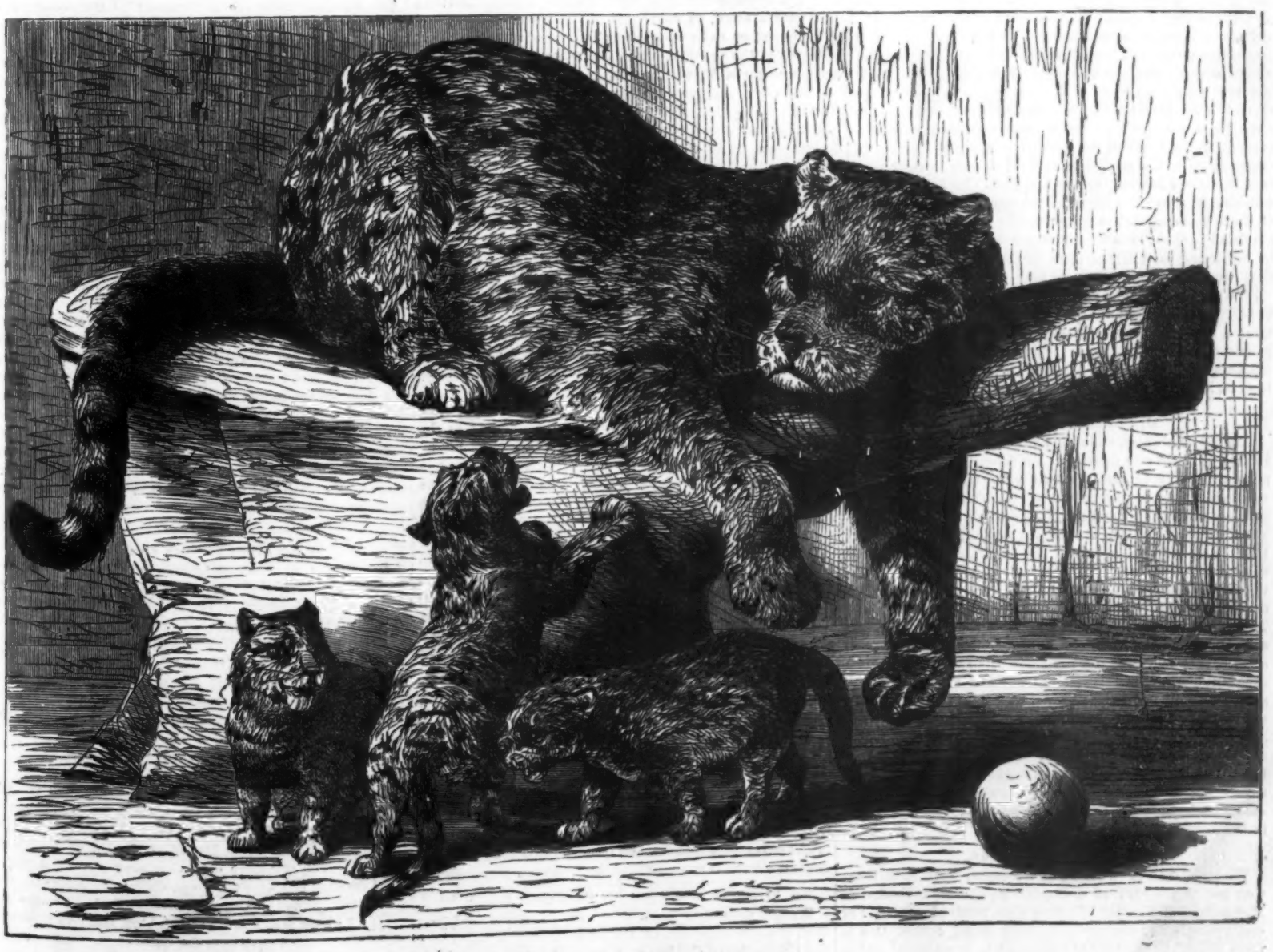
In mixing these ingredients together, heat the mineral oil slightly, and stir in the soapstone in a finely pulverized state; then add the plumbago, also pulverized, and finally the flowers of sulphur, stirring the mass until a homogeneous mixture is produced. If tallow, rock salt, and palm oil are used, melt the tallow; then add the mineral oil and palm oil, and, while this mixture is yet hot, stir in the remaining ingredients until a homogeneous mass is produced.

The object of the flowers of sulphur and of the rock salt is to keep the journals cool; and the soapstone and plumbago also have somewhat the same effect, while they are used particularly as vehicles to distribute the lubricating material uniformly over the journal, and to prevent the journal from coming in contact with the box.

Brave Boys.

At Rochester, N. Y. lately, says the *Democrat*, one Friday night a man threw a small dog into the river from the railroad bridge. Instead of passing over the falls, as was expected, the dog reached a large piece of ice close to the brink. He was seen there Saturday, Sunday, and Monday, but no one ventured to rescue him. An attempt was made to induce him to jump into the river by throwing stones at him, but it failed. The moaning of the dog, during the night, was painful to listen to. About noon on Tuesday, two small boys passed over the bridge, and, seeing the dog, determined to rescue him. Neither one of them would go alone, but each challenged the other to go with him. They started, walked through the cold water to where a single misstep would have sent them to their death below the falls, picked up the poor dog, and regained the bridge in safety, to receive the hearty compliments of those who had witnessed their daring adventure. The dog when rescued had been on the ice just above the brink of the falls for four days, and was so weak that he could not stand up. It would afford a great deal of satisfaction to many that witnessed the dog's misery to see the man who threw him into the river properly punished.

TO SOLDER German silver, pour out some spirit of salt in an earthenware dish, and add a piece of zinc. Then scrape clean the edges to be soldered, and paint over with the spirit of salt. Apply a piece of pewter solder to the point and melt with the blowpipe.



FEMALE JAGUAR WITH HER YOUNG.

British Trade Mark Registration.

A new act of Parliament takes effect January 1, 1876. Its provisions, so far as they go, are good enough, but it is our duty, says *Iron*, to call the attention of our readers to the important fact that no very great space of time is afforded them for registering their trade marks. An office for registration is to be opened not later than January 1, and it is also enacted that *no person shall be entitled to institute any proceedings for any infringement of a trade mark after the first of July next, unless such trade mark be registered.* Six months, then, comprise the margin allowed for the registration of existing trade marks in the United Kingdom—no very long period when we consider the tardiness of our country in adopting a system long since recognised and enforced in others. There will be a great deal of work to be got through in the first six months of the ensuing year, but, with the experience of the Patent Office to guide them, the Commissioners of Patents have ample means for forming a system.

Readers of *Iron* will, of all people, the least need reminding of the importance of securing the legitimate trader in the enjoyment of the peculiar device by which he distinguishes his goods. To the public it is an indisputable advantage that cutlery or other goods should bear not only the name, but the mark of the maker, while the strict inviolability of his cognisance is to the latter of vital necessity. As the ancient craftsman hung out a sign over his shop to tell his business to the large majority of clients who could not read his name, so have modern manufacturers, whose goods are carried all over the world, among men of every color and language, adopted marks which speak a language equally comprehensible to the Tartar and the Guacho. No stronger proof of the value of a symbol which has been impressed upon goods of special quality can be brought forward than the evil persistence with which the most celebrated trade marks of Sheffield were pirated in the days when commercial treaties as yet were not. The mere name of the maker, which might appear sufficient for every purpose to those who have not given much thought to the subject, practically affords the slenderest kind of protection. It would be impossible to restrain another maker of similar name from putting it upon goods made in imitation of those which have acquired world-wide renown, and a trick not unknown in local elections in the West of England—the finding of a man of straw bearing the same name as a popular favorite—would be easy of perpetration. In the case of the Messrs. Coats, a firm of the same name in the United States having imitated their wrappers, and thus seriously interfered with their trade, the courts stopped the imitation, but of course could not prevent the use of the name. This restriction, however, proved sufficient, as purchasers at once saw the difference in the wrappers, and the mere similarity of name did little harm. Glenfield starch, again, has often been inquired for as the starch "with a long chimney upon it," and Asiatic customers exist who buy certain English goods by the trade mark alone. It is needless to multiply instances of the superior importance of the symbol to the name: suffice it to recall the fact that one special kind of knife, which had a great reputation in certain parts of South America, went completely out of fashion in consequence of the market being flooded with inferior German imitations bearing the same mark. The advantage of a distinctive sign has received ample recognition at the hands of those best qualified to appreciate its importance. A single firm has spent in a couple of years as much as $15,000 in protecting their marks from infringement—a very practical test of the value they set upon them.

[We suppose we need not remind readers of the SCIENTIFIC AMERICAN that, under the American patent law, all trade marks, no matter how long they have been in use, may be patented, or, in other words, registered. Full information can be had at this office. No manufacturer should neglect to avail himself of this important protection.]

Preparation of Ebonite.

The use of ebonite, one of the newer preparations of india rubber, is constantly increasing, on account of its better applicability to many purposes in the arts than its near ally, vulcanite. The two substances are quite similar, being composed of india rubber and sulphur, with some preparation of gutta percha, shellac, asphalte, graphite, etc., although these latter are not essential. In vulcanite the amount of sulphur does not exceed 20 to 30 per cent, whereas in ebonite the percentage of sulphur may reach as high as 60. An increased temperature is also required for this preparation. The approved formula consists in mixing together 100 parts of rubber, 45 of sulphur, and 10 of gutta percha, with sufficient heat to facilitate the combination. In manufacture, a sufficient quantity of this mixture is placed in a mold, of a desired shape, and of such material as will not be affected by the sulphur contained in the mass. It is then exposed to heat of about 315° Fah. and a pressure of about 12 lbs. to the square inch, for two hours. This is done most readily by placing the mold in a steam pan, where the requisite pressure and temperature can easily be kept up. When cold, the ebonite is removed from the mold, and finished and polished in the usual manner.

The Dioptric Light.

We published in our issue of December 4, 1875, an illustration and description of a dioptric light, the invention of Major-General Meigs. We have since received a number of communications relative to its being an old device. One is from Mr. W. C. Gayton, of Chicago, Ill., in which he claims that the spherical lens has been in use in England for more than 30 years. It is much used by lace makers, he states, who require a strong light; and a single candle, if surrounded by a circle of these glass globes filled with clear water, will give light enough for four or five women at this work, which is very trying to the eyes.

C. G., of Upper St. Clair, Pa., states that another form of the device consists of a globe half filled with water and half with lard oil. This forms the lamp, and a globe of water is suspended at a little distance, so as to throw a clear light on the work.

THE NEW NEBULAR THEORY—POSSIBLE WORK FOR THE ASTRONOMERS.

In a recent issue we published a brief note calling attention to a recent experiment, made by a French scientist, in which a cloud of metallic particles, carried from an electrode by the electric current, assumes, in the midst of an environing liquid, a gyratory spiral movement, under the influence of a magnet. It will suffice to glance at the annexed engravings (taken from *La Nature*), which well represents this experiment, to recognize the forms of the spiral nebulæ described by Lord Rosse, some of which have the curvature of their branches directed opposite to the course of the hands of a watch, as shown in Fig. 1, as in the case of the nebula of *Coma Berenices*, etc., and others in the same direction, as is seen in the nebula of *Canes Venatici*. In view of this somewhat striking analogy, M. Gaston Planté's suggestion, that the nuclei of these nebulæ may be constituted by electrical action, and that the spiral form may be determined by the presence of highly magnetic celestial bodies in the vicinity, seems not wholly improbable. The gyratory motion in opposite directions would then be explained, as the experiments show, by the nature of the pole of the magnet which happened to be turned toward each nebulous mass, as indicated by the positions of the arrows in the engravings, and the magnets, A and B.

Fig. 1.

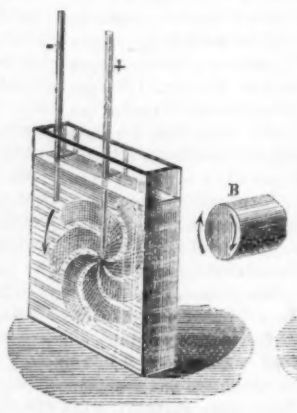
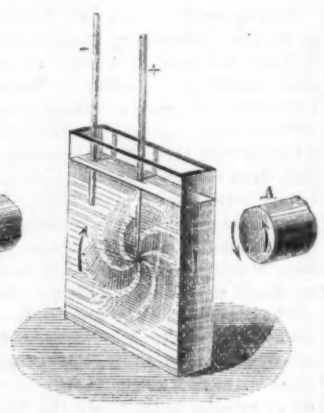


Fig. 2.



If this view be accepted, the next step is to examine known stars in the vicinity of the nebulæ, in order to determine which, by their position, are capable of exerting this magnetic influence, or to explore the heavens about the axes on which the spirals appear to revolve, in order to discover new bodies to which the same result may be attributed. Then, if a star be found satisfying the conditions, it will become necessary to search along the line passing through the centers of the nebula and the star, to find out whether there is, in relation to the other magnetic pole of the star, a second nebula, the spirals of which, turned in opposite direction to the magnetic currents of that pole, appear nevertheless to the observer as if rotating in the same direction as the first nebula. These three bodies would then constitute a symmetrical system, and the hypothesis that such might exist is not inadmissible in view of the vast profusion of cosmic matter distributed through stellar space.

Such researches as are above described would require the most powerful instruments; and if they should lead to the results indicated, decisive proof might be considered as deduced in favor of the electric origin of the heavenly bodies.

M. Planté, in answer to the objection which might be raised, that there does not appear in space any conducting medium leading an exterior electric current to the center of the nebulæ, recalls other experiments made by him with powerful electrical sources. He states that he has observed small luminous rings, composed of incandescent particles, quite detached from the electrode. These rings, the interiors of which were agitated by liquid currents, moved in the space comprised between the electrode and a larger luminous ring formed about them by the impact of the electric wave against the sides of the voltameter.

These rings, he considers, are true electrical nuclei, separated from the principal flow which generated them, and analogous to the nuclei of isolated stars or to stellar agglomerations, such as those which constitute the annular nebulæ of *Lyra, Cygnus*, and the Milky Way. He adds the somewhat startling assumption that the large luminous ring, which forms the limit of the development of the electric wave in the voltameter, might even reveal to us the existence of an immense annular nebula, which, though to us invisible, might envelope all others, and form the extreme wave of the general electrical movement of the Universe.

Mr. Lick's Mammoth Telescope Again.

We are pleased to learn from our California exchanges that, at a meeting held on December 7, of the Regents of the University of California, a communication was received from Mr. Lick, apprising them of his bequest of the sum of seven hundred and fifty thousand dollars, to be expended under his direction in the construction of an astronomical observatory and the purchase and erection of the largest and best telescope that art and science can produce. The spot selected for the placing of this telescope is upon the summit of Mount Hamilton, in the county of Santa Clara. This mountain is some 1,400 feet higher than Mount Diablo, and is said to be free from fogs at all times of the year. The county of Santa Clara has charged itself with the building and maintenance of a good road to the summit; and the Regents of the University have made application for a section of the land, to be listed to the University, with a view of devoting it to the purposes for which it is designed by the generosity of Mr. Lick. It is estimated that the purchase and placing of the telescope and other scientific apparatus will cost about $300,000, leaving a fund of $450,000 for its maintenance and for instruction in this department of Science.

New Alloy for Iron.

BY PROFESSOR SERGIUS KERN.

Experiments proved that, by using chromeisen instead of spiegelesen, extremely soft steel is obtained; rods made for experiments were very easily bent, even by hand. It is seen, from these attempts to replace spiegeleisen by chromeisen, that the use of the chrome iron alloys is limited, and the steel obtained is for most purposes too soft for the manufacture of such materials as rails, axles, tires, etc.

During some experiments with the chrome iron alloys, a strange phenomenon was observed. It is well known that chromium is extremely hard, and scratches even hardened steel; meanwhile an alloy was obtained which was malleable, and in a fresh state could be easily bent. It was also remarked that sometimes in opening the crucibles nothing but slag was found; but in breaking the crucibles, the alloy was found to be in the bottom of them. That may be attributed to the corrosive properties of the liquid alloy, which often penetrated even through the bottoms of plumbago crucibles.

The abovementioned alloy was analysed, and the following average composition was found·

Metallic iron, 96·40 per cent, metallic chromium, 2·30 per cent; carbon, traces; lime, silica, 1·30; total, 100·00.

By melting a mixture of cast iron, tin, and lead in the following proportions, a very liquid alloy is obtained:

Cast iron, 79·00 per cent; tin, 19·50 per cent; lead, 1·50; total, 100 00

The alloy has a very handsome appearance, and fills perfectly well the casting molds; thus it could be used for casting small articles. The alloy is to some degree malleable.—*Chemical News.*

Something New in Boiler Flues.

The National Tube Works Company, of McKeesport, Pa., says the *Times*, are now manufacturing wrought iron lap-welded tubes in all sizes up to fifteen inches diameter, the larger of which are now being adopted on our steamboats for boiler flues, instead of the riveted flues, and the following steamers are now using them for this purpose: Steamer Vince Shinkle, two boilers, forty seven inches diameter and twenty-four feet long, ten lap-welded flues in each, of eight inches diameter; steamer Cons Miller, two boilers forty-one inches diameter, twenty-four feet long, with six lap-welded flues in each of ten inches diameter; steamer Golden Rule, three boilers, forty-four inches diameter, twenty-six feet long, with three eight and three ten inch lap-welded flues in each. These tubes are giving perfect satisfaction, and the local inspector at Cincinnati says they have proven themselves all that could be desired. There are many advantages claimed for these tubes, as flues, among which we might mention the following: They are cylindrical in form, a point not claimed for the riveted flue, thereby lessening the chances of collapsing, if not absolutely preventing accidents of this kind. There are no rivet heads or laps to interfere with the draft, and consequently the flues are not liable to choke up with soot, are much less apt to scale, and, having a smooth unbroken surface, are of course much more easily cleaned, a fact that will be appreciated by the firemen. Another point claimed is that they are of uniform gage, having no rivets or laps, and must naturally require much less fuel, a fact that will undoubtedly receive due consideration.

Waterproof Tissues and Paper.

Les Mondes says that bichromate of potassa has the property of rendering glue and gelatin insoluble in water. Thus paper, and stuffs of cotton, linen, or silk, if once coated with this insoluble glue, become perfectly impervious. To render glue insoluble, it is sufficient to add, to the water in which it is dissolved, 1 part of bichromate to 50 parts of gelatin. The addition is only made at the moment when the liquid is to be used. The process is conducted in full daylight. The Japanese make their umbrellas with paper prepared in this manner.

The Brighton Express.

Brighton is fifty-three miles from London, and the railroad which connects these two cities is the famous one of the world for speed, for safety, and for the enormous wealth of its commuters. From fifty to sixty miles an hour is the rate of speed, and there are no stopping places. A billiard ball does not roll over the green cloth with more ease than this train moves. A correspondent of the *Evening Post* says: "I have seen the sea at Brighton, and fifty-three minutes afterwards I have seen the dome of St. Paul's through the fog of London. The tracks are kept in perfect order, and the cars are built of solid mahogany."

SCIENTIFIC AND PRACTICAL INFORMATION.

NEW INVESTIGATIONS IN MAGNETISM.

MM. Treves and Durassier have recently investigated the question of whether, and how, in a steel magnet, the known portative force varies when the weight and section are affected by the gradual dissolution of the magnet in an acid. The result is that the force is always proportional to the section and to the weight, so that a curve representing the variation of weight and section would be parallel to one indicating the diminution of intensity. As the dissolution progresses, the metal shows serrated inequalities perpendicular to the axis of the bar; and if a horseshoe magnet be treated, the curved part is found to dissolve incomparably quicker than the straight portions.

A NEW MODEL FOR SHIPS.

The circular ironclad lately constructed in Russia, and described in the SCIENTIFIC AMERICAN of August 7, 1875, may possibly lead to a radical change in the construction of sea vessels other than those for warlike purposes. A young officer of the Russian navy, attached to Admiral Popoff's staff, has constructed a saucer-shaped sailing yacht, 20 feet in diameter, which is described as extremely fast. The little craft is cutter-rigged, with an exceedingly high mast, and has great speed under canvas, in combination with an altogether unequaled power of staying and wearing. She is perfectly round, decked somewhat after the fashion of a Bermuda boat, and, having great stability, can carry, almost without inclination, all the canvas which it is possible to spread upon her. Strange to say, she is extremely handy as well as fast. Such, at least, is the account given of her in the London *Times* by Mr. E. J. Reed.

OXYCHLORIDE OF SULPHUR.

Paul Behrend, of Leipsic, has recently discovered a new and convenient method of preparing the oxychloride of sulphur, also known as sulphuryl chloride, SO_2, Cl_2. This was accomplished by taking sulphuryl oxychloride (SO_2, HO, Cl,) which is formed by the union of sulphuric anhydride with hydrochloric acid, and sealing it up in glass tubes which were heated for 12 or 14 hours to a temperature of 338° to 356° Fah., in a paraffin bath. On distilling the contents of the tube, pure sulphuryl chloride was obtained.

METALLIC GALLIUM.

The new element gallium has recently been obtained in a pure metallic state by M. Lecoq. Its brilliancy places it between platinum and silver. It was obtained by treating electrolytically the aqueous solution of its ammoniacal sulphate, and the very coherent deposit formed was subsequently burnished.

The Food Equivalent of Health.

General Sherman, in his chapter on the "Military Lessons of the American War," says: "To be strong, healthy, and capable of the largest measure of physical effort, the soldier needs about 3 lbs. gross of food per day, and the horse or mule about 20 lbs. An ordinary army wagon drawn by six mules may be counted on to carry 3,000 lbs. net, equal to the food of a full regiment for one day; but by driving along beef cattle, a commissary may safely count the contents of one wagon as sufficient for two days' food for a regiment of 1,000 men; and as a corps should have food on hand for twenty days ready for detachment, it should have 300 such wagons, as a provision train; and for forage, ammunition, clothing, and other necessary stores, it was found necessary to have 300 more wagons, or 600 wagons in all for a *corps d'armée*. Each regiment ought usually to have at least one wagon for convenience to distribute stores, and each company two pack mules, so that the regiment may always be certain of a meal on reaching camp without waiting for the larger trains." A curious calculation of a similar nature exists, made by Tempelhoff, a Prussian general, the historian of Frederick's wars: "100,000 men," he says, "consume daily 150,000 lbs. of flour, equal to 200,000 lbs. of bread. Bread and forage are seldom to be had in sufficient quantities on the spot—hence magazines are established along the line of operations. The bread wagons carry a supply for six days, the men for three more. In commissariat wagons, flour for nine additional days could be conveyed—one wagon to 100 men for nine days, thus 1,000 wagons supplied the army for that time. An operation of 18 days' duration could thus be conducted without an intervening magazine, but field ovens were required to make the flour into bread. But bread for three days requires two days to bake it; at the end of six days, therefore, a halt must be made to bake or else the ovens would fall behindhand with the supply; so that, in advancing into an enemy's country before magazines could be formed there, six days was the extent of march practicable without a halt."

A strange Explosion in Boston.

A singular explosion occurred in South Boston on the evening of December 22. A large gas main, running under the Federal street bridge and along Federal street, exploded, tearing up the pavement, killing and wounding a number of people, and blowing others into the water. It is supposed that gas had escaped from a defective pipe until the ground had been saturated by an explosive mixture of gas and air. How it was fired is not known. The main pipe, about five inches in diameter, passes through under Federal street bridge, and along the causeway leading from it up Dorchester avenue, the continuation in South Boston of Federal street. This causeway is composed of three feet or more of dirt and gravel, with the pavement resting on a foundation of piling, and on either side, for 17 feet or more, is the river.

Eye witnesses state that a bright flash was first seen about the middle of the causeway, followed by a sharp explosion and paving stones, gravel, and *débris* flying in all directions. Almost immediately the causeway on the right hand side fell over into the river, carrying over with it several persons. The number of these is not yet ascertained, but it is feared several were buried under the *débris* at the bottom of the river. The pavement was completely torn up for a distance of 175 feet from the wooden portion of the bridge to Crosby's warehouse, which was seriously shattered. Had the explosion occurred five minutes later the loss of life would have been far greater, as the draw of the bridge had been up for some time, and a crowd of 300 or 400 persons, on their way from the city to their homes in South Boston, had collected on this side, and in a few minutes would have swarmed upon the causeway.

Another Subterranean Explosion.

An explosion in one of the city culverts of Philadelphia, Pa., accompanied by the rupture of a gas main and the upheaval of inlet covers and the iron tops of manholes, coming soon after the fatal occurrence of a somewhat similar nature in Boston a few days ago, has led the *Public Ledger* of the former city to make some inquiry into the fact. It does not appear that the explosion came from any contact of inflammable gases with fire, as there is no account of any flames having been seen by anyone. A rupture of a small gas main seems to have been an incident of the violence, and not the cause of it. The damage appears to have been occasioned by confined air, compressed within the culvert by the backing up of the tide water of the river to such a degree as to break out through the inlets and manholes with great force. This is not an unusual occurrence, and not by any means so dangerous as the ignition and explosion of inflammable gas in a culvert would be.

The Value of the Scientific American.

S. S. B. says: "I believe that, since its first year (1848, I think) I have missed but one year's numbers of your journal. In the burning of my house, four years ago, I lost some 18 years of your paper, with many other valuable books; but none was so great a loss as the file of your paper. In 1854, I lent a volume of the paper to a friend of mine, who was erecting a factory. He told me that that volume of the SCIENTIFIC AMERICAN saved him about $800 in the construction of a grist and saw mill."

D. L. R. says. "The SCIENTIFIC AMERICAN affords me more pleasure than anything else that I can find in the literary line. It is indeed a great storehouse for deep, interesting thought. Not a bit of room is wasted. As an American I am proud of it, and wish it all prosperity from ages on to ages."

F. McC. says: "I cannot refrain from saying a word for the SCIENTIFIC AMERICAN. As it is now conducted, it cannot be beaten as a scientific periodical. I make it a rule to always take my copy to the weekly meetings of our association, and never fail in finding something to read aloud to the members, with profit to them all. You are doing a world of good in sounding the Keely motor."

Rendering Wood Fire and Water Proof.

M. P. Folacci has devised a new mode of rendering wood waterproof and incombustible, which involves the use of the following composition: Sulphate of zinc 55 lbs.; American potash 22 lbs.; alum (ammonia base) 44 lbs.; oxide of manganese 22 lbs.; sulphuric acid at 60°, 23 lbs; river water 55 lbs. The above ingredients, with the exception of the sulphuric acid, are mixed in a boiler, where the water is added at a temperature of 113° Fah. As soon as solution is effected, the acid is gradually poured in. To prepare the wood, the timbers are placed in a suitable chamber, on gratings, and separated by spaces of about a quarter of an inch. The composition is then pumped in to fill completely the receptacle, and is maintained therein in a state of ebullition for three hours. The wood is then withdrawn, and dried in the air. According to the inventor, it becomes practically petrified, and the most intense flame only carbonizes the surface very slowly.

A Magnetic Island.

The volcanic rocks composing the foundation of the Isle St. Paul are ferruginous. Those on the north side of the crater, which result from the slips whereby all the east side of the mountain is laid bare, attract the two poles of a magnet, and contain 6 per cent of iron. Those met with around the cones of scoriæ situated at the foot of the exterior slopes of the crater, on the sea shore, are true magnets with two poles, containing 14 per cent of iron. The observations made for declination and inclination indicate the local action of a south pole toward the center of the crater, a fact which should warn navigators to guard against the magnetic influence of this isle.—*A. Cazin, in Comptes Rendus.*

Useful Recipes for the Shop, the Household, and the Farm.

Round steel wire rope will bear more than double the weight required to break iron wire rope of similar diameter.

The following is the London rule for gas pipe sizes: For 200 lights, 2 inch iron tube; 120 lights, 1¼ inch; 70 lights, 1¼ inch; 50 lights, 1 inch; 25 lights, ¾ inch; 12 lights, ½ inch; 6 lights, ¾ inch; and 2 lights, ½ inch.

Apply soapsuds to a suspected leaky joint in the gas pipe. The formation of bubbles will show any escape. This is safer than trying the joint with a lighted match. If the leak occur in the branch of a bracket or chandelier, it is repaired by soldering with plumber's fine solder; if it be a very small one, heat the place first with a spirit lamp, and fill the aperture with cement.

The drive wells which are extensively used in the South and West are made as follows: A piece of 1¼ inches gas pipe is perforated with several hundred holes near the end, which is covered with a fine brass wire screen, and this in turn is protected by a covering of sheet zinc or iron also perforated. The extremity of the pipe is sharpened, or a steel point may be fixed. It is then driven into the ground, adding pieces on the top as it sinks in. As soon as the proper depth is reached, a pump is attached, and the result is an inexhaustible well, often giving an abundant supply of water in half an hour after the end of the pipe first entered the soil.

NEW BOOKS AND PUBLICATIONS.

THE ALDINE, a Fortnightly Journal devoted to the Fine Arts and Literature. Price 50 cents a number. New York city: The Aldine Company, 18 and 20 Vesey street.

This publication is of the rarest beauty in typography, engravings, and paper that we have ever seen. It was first published in 1869, and we have recently perused with great care all the numbers since issued, up to that for December, 1875; and it is with the greatest satisfaction that we attest the gradual improvement of the work, from the first number to the last issued, until now, when it has attained a higher standard of perfection than any illustrated journal on this continent. The superb engravings illustrate highly artistic subjects, some from Nature, and others from the paintings of our best American and the most celebrated foreign artists, all of which are executed by our best engravers. The *Aldine* is to be published twice a month in the coming year, and the publishers promise to give their readers engravings of historical events, appropriate to the Centennial year. We can add, in closing this notice, nothing that gives a more concise and truthful idea of this artistic publication than the words of our honored American poet, William Cullen Bryant. He says:

"In England and Italy we have the best printed books, and I think in England the best impressions of engravings made; but I have never seen anything comparable to the work of THE ALDINE: nothing so fine, the ink put upon the block in such just proportions, not too much, not too little, impressed on the paper with the greatest care and dexterity; no blot, no blur, no blank—the slenderest, lightest and most delicate lines impressed with the greatest certainty, so that the impression represented the original engraving on the block as it left the hands of the artist, with as much fidelity as a mirror reproduces the lineaments of the human countenance."

HYDRAULIC MANUAL. PART I, consisting of Working Tables and Explanatory Text, intended as a Guide in Hydraulic Calculations and Field Operations. By Louis D'A. Jackson, A. I. C. E. London: W. H. Allen & Co., 13 Waterloo place, S. W.

This is the third edition of probably, to the hydraulic engineer, one of the most useful of professional treatises. It embodies a collection of working tables, based on the most improved modern principles and enough text to set forth both principles and formulæ in a manner both clear and concise. The work has been prepared under the auspices and with the assistance of the English civil officials in India; and the second part of the book, now added, consists entirely of hydraulic and meteorological statistics, the former principally, the latter altogether, Indian. The present edition includes, beside the above, many new tables and considerable amplification of the text, and forms, as a whole, a valuable compendium both of the works of many of the best authorities on hydraulic engineering and of several valuable and hitherto unpublished manuscripts. D. Van Nostrand has the book for sale in New York city.

THE POPULAR HEALTH ALMANAC FOR 1876. New York city: E. Steiger, Frankfort street.

This is a laudable effort on the part of Mr. E. Steiger, the well known publisher and importer of German scientific and other works, of this city, to produce a popular calendar which will replace the well known yellow covered pamphlets which now serve the double purpose of almanacs and advertisements of quack medicines.

DECISIONS OF THE COURTS.

United States Circuit Court—Southern District of New York.

PATENT BILLIARD TABLE.—LEVI DECKER *vs.* WILLIAM H. GRIFFITH & CO.,—LEVI DECKER *vs.* CHARLES SILVERBRANDT.

[In equity.—Before Blatchford, J.—Decision rendered November 5, 1875.]

The patent sued on in these cases, being a reissue granted to the plaintiff, Levi Decker, March 9, 1869, on the surrender of the original patent granted to him December 18, 1866, for an "improvement in Cushions for Billiard Tables," has been heretofore the subject of consideration by this court in the case of Decker *vs.* Grote (10 Blatchf. C. C. R., 331). The invention set forth in the specification of the patent has reference to a cushion formed of india rubber.

The claim in this case is for the catgut or other cord E, partially or fully embedded, or otherwise attached at the angle *a* of the rubber cushion C, so as to protect said cushion against the impact of the ball, substantially as herein shown and described, and for the purposes set forth.

The manufacture and use by Winant, prior to the alleged date of invention by Decker of his device, of a strip of spring steel, or equivalent material, with holes in its lower edge, through which wires were passed and fastened to the under side of the rail, said strip being placed in a crease or groove cut in the upper face of the rubber near the angle thereof, and the manufacture by Stevens, prior to 1864, of india rubber cushions for billiard tables, having a French clock spring placed in a slot in the upper face of the rubber, parallel to and near the inner face of the rubber, bringing the upper edge of the spring near the upper corner of the rubber, are substantially the same arrangements of devices used by Decker.

Bill dismissed.

[*William J. A. Fuller*, for the plaintiff.
Edward N. Dickerson, for defendants.

Recent American and Foreign Patents.

NEW CHEMICAL AND MISCELLANEOUS INVENTIONS.

IMPROVED ELECTRIC CABLE AND CONDUCTOR.

George W. F. Hoogeveen, Haarlem, Netherlands.—This inventor proposes a series of telegraph wires, which are covered with gutta percha, and sewn within a covering of sail cloth made perfectly impervious to moisture and other disturbing agencies, by being impregnated and coated with highly insulating material. The latter is a mixture of paraffin and glycerin, provided on the outside with a coat of coal tar and sulphur, and having on the inside a coat of rubber varnish and benzine.

IMPROVED SWINGING SHIP'S BERTH.

Edward P. S. Andrews, Lisbon, Me.—This inventor, in order to prevent sea sickness, proposes berths pivoted to the cabin walls, and connected by separate and jointly-swinging governing end plates, of which one is applied to a swinging weight of corresponding size, to produce the level position of the berths. A pivoted hook lever of each berth may be attached to the corresponding end piece, to swing therewith and with the weight, or to a staple of the wall, to assume a fixed position at the wall. By this arrangement, the berths will always remain level; or any one of them may be fastened and held rigidly to the vessel, in accordance with the desire of the occupant.

IMPROVED CRACKER MACHINE.

Charles S. Fowler, Brooklyn, N. Y.—This invention has for its object to improve the construction of the class of machines that are used for cutting dough for crackers, cakes, etc., so as to enable them to be more readily adjusted and more thoroughly controlled than when made in the ordinary way. The arrangements are such as to allow the dough to shrink before reaching the cutters, so that the crackers or cakes will not be drawn out of shape by said shrinkage. The construction embodies many new and ingenious devices.

IMPROVED ENVELOPE OPENERS.

John La Blanc and Xavier St. Pierre, Ophir City, Utah Ter.—The device, which is attached to the end of a pencil, consists of a blade enclosed between guides of india rubber. The latter serves as an eraser, and, when acting as a guide for the blade, adapts itself to envelopes of different thicknesses.

IMPROVED METHOD OF CONCENTRATING TAILINGS FROM QUARTZ MILLS.

Francis E. Mills, Virginia City, Nev.—This invention consists in first causing the mingled sands, sulphurets, quicksilver, and water to flow through a wide and shallow sluice with small transverse slits, called riffles, cut through its bottom. Each riffle opens into a tank filled with standing water. In passing over these water riffles, the coarser and heavier sulphurets and globular quicksilver sink through the water spaces into the tank and are saved, while most of the sand and some of the exceedingly fine and light sulphurets and minute particles of floured quicksilver are carried on through the sluice by the current, which then flows into another sluice of reverse form. Here the sands gradually arrange themselves into different horizontal strata, according to the coarseness of the grains, the fine sulphurets, minute particles of quicksilver, etc., finding their way to the bottom of the sluice among the moving grains of the coarsest sand. Near the bottom of this deep narrow sluice, at the lower end, is inserted a very thin sheet of metal, which divides the running current horizontally, cutting off the lowest stratum of coarse sand, containing the fine sulphurets, etc., from the main body of the flowing sands above it without disturbing the current, so as to discharge the former into a separate vessel. The very fine sulphurets, etc., are separated by passing them through a fine screen.

IMPROVED MUSIC RACK FOR UPRIGHT PIANOFORTES.

Stephan Brambach, New York city.—This is a swinging desk or stand, arranged at the front of an upright pianoforte case, provided with a hinged base strip and extension legs for supporting jointly the music book and holding desk in inclined position.

IMPROVED PAPER BOX.

David K. Osbourn, Baltimore, Md.—This is a neatly shaped box, formed of a single piece of paper and provided with a rear extension, which serves as a cover and as a means of suspension. It also has suitable stiffening pieces within.

IMPROVED SLEEVE ADJUSTER.

Alfred Pergo, New York city.—In order to hold the cuffs of a shirt away from the hands, while the latter are engaged, this inventor proposes a button-holed tab on the sleeve and a button on the shoulder of the garment. The cuff can thus be fastened up without first removing the coat.

IMPROVED DUMPING DEVICE FOR FILLING GRAVES.

John W. Vannice, Crawfordsville, Ind.—This is a device for receiving the soil thrown up in digging graves and dumping it all at once into the grave to fill the same. It consists of a box provided with suitable doors, which stands beside the grave and is filled with earth as the same is excavated. When it is desired to replace the soil the box is tilted, when arms strike against latches which hold the doors, open the latter, and thus allow the earth to be discharged.

IMPROVED SIGN AND ORDER SLATE

Joseph S. Gold, Washington C. H., Ohio.—This invention is designed for the convenience of professional men, but may be used by all who may find it a convenience; and it consists of a sign having on its back side a sliding slate, which slate is raised by means of a cord, and is covered, when down, by a self-acting lid.

IMPROVED TOBACCO DRYER.

Henry R. Farmer, Ringgold, Va.—This inventor proposes a heating apparatus for buildings, in which tobacco is stored in order to cure the tobacco by artificial heat radiated directly from pipes made to conduct the warmth about the lower part of the room from a furnace outside provided with regulating valves or gates. A valve or register, located directly over the hot air pipes, so tempers the heat at the entrance into the barn that the building is protected from burning.

IMPROVED WIRE FENCE STAPLE.

Homer S. Smythe, Aurora, Ill.—This invention relates to certain improvements in staples for wire fences, and it consists in a staple having a short prong and a long prong, the latter of which terminate at one end in a chisel point, and at the other in a beveled head, and is provided with barbed notches to hold it more securely in place.

IMPROVED CARTRIDGE BELT.

Major David Taylor, Paymaster U. S. A., Leavenworth, Kan.—This invention consists in arranging button holes on a soldier's cartridge belt between sections thereof, making slots near the ends, using clips of the same length as the cartridge or as the width of the belt, and in making the clip with a point and so constructed as to hold the cartridge with muzzle downwards. The first improvement allows a pistol holder or other attachment to be readily applied or detached, the second allows the buckles and clips to be fastened by reversing the end of the holding strap, the third gives a more stable and efficient support to the cartridge, and the fourth allows the clip to extend above and below the cartridge to give the former a greater bearing on the latter.

IMPROVED CARTRIDGE.

George Smith, Brooklyn, N. Y.—This is a strong paper or strawboard tube or shell, in which the charge is confined by a metallic wad at each end. The wad at the outermost end retains the charge without necessitating the folding-in of the outer end of the shell, and, by the explosion, its edges are expanded to such extent that it forces the shell out of the gun. The wad at the inner end is forced out of the shell and left in the gun, to be dropped out after firing.

IMPROVED RAILWAY TELEGRAPH.

Baylus Cade, Scott Depot, W. Va.—The object of this invention is to reduce the risks incident to life and property upon railway lines resulting from an ignorance on the part of the train men of the condition of the road and the position of other trains thereupon. The invention has in view the placing and keeping of all of the trains upon the route in a single telegraphic circuit which is continuous from one end of the line to the other, and is never broken, whereby each moving train is in itself a station which is in communication with all the other trains as well as the terminal and intermediate fixed stations, by means of which arrangement one train may telegraph to the train preceding or following it, or to any one of the fixed stations, and the messages sent from one point to another are reproduced in the usual way upon all of the intermediate trains and stations.

IMPROVED TAILOR'S MEASURE.

Friedrich H. Ulrich, New York city.—This is an improved tailor's measure, by which the different dimensions of the body can be taken quickly, conveniently, and accurately, to enable the tailor to produce a good fit, and furnish a basis for an improved system and apparatus for drafting the patterns. It consists of a graduated belt, with suitable back clasp and sliding bip clasps, to which a detachable measure is hung for taking the different measures required.

IMPROVED TEMPORARY BINDER.

Charles D. Lindsey, Cincinnati, O.—In this device, a notched spring plate is employed to secure or hold one or more fasteners in place upon a suitable block. The paper fasteners are so clamped as to be supported firmly in an erect position.

IMPROVED SAUSAGE STUFFER.

Hugh P. Rankin, Allegheny, Pa.—This invention relates to certain improvements in sausage stuffers, and it consists in a barrel or cylinder pivoted upon trunnions on a framework, and provided with an adjustable nozzle. In said barrel moves a piston, which is rigidly attached to a screw-threaded rod, which said rod is actuated longitudinally in the barrel by means of a bevel gear which operates through a revolving sleeve and an adjustable screw-threaded segment. The latter, by engaging the threads of the piston rod, converts the rotary motion of the sleeve into a longitudinal rectilinear motion of the piston, and a stud upon the framework engages a longitudinal groove of the piston rod to keep the latter from turning.

IMPROVEMENT IN WEATHER VANES.

William H. Pickering, Boston, Mass.—In looking at a weather vane standing "end on," it is difficult to tell whether it is pointing toward or from the observer. To show this, the present inventor suggests attaching to the vane pivot two arms inclined downward, one of which carries a ball, and the other a piece of glass set in a frame. It is then easy to tell, by the position of the ball to the right or left of the vane, in which direction the latter is pointing.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED TYPE WRITING MACHINE.

Philander Deming, of Albany, N. Y.—This invention consists, first, in printing each word with an initial letter different from the others composing it, such initial standing in lieu of a space to distinguish the beginnings of words; and secondly, in the manner of grouping the different sets of letters to admit of the most rapid manipulation of the keys.

IMPROVED RAIL JOINT.

Hermann Weber, New York city.—In this device an auxiliary fish plate is placed upon the bolts, which are provided with wedge-shaped notches on their upper and lower sides, and when moved longitudinally the edges of said plate enter the notches in the bolts, and thus lock the said bolts in place. The plate is made narrower than the regular fish plates, and in its upper edge is formed a number of teeth to receive a pawl, which holds it from working back when it has been driven into place.

IMPROVED WATER WHEEL.

Isaac Mallery, Dryden, N. Y.—This is a turbine wheel having the chutes divided horizontally. The case and the chutes are so arranged that the mouths of the latter open at the top of the case instead of the sides. A horizontal gate is arranged on the top plate, which may be adjusted at any time to close tight without too much friction.

IMPROVED SMOKE STACK.

Darerick Allard, St. Albans, Vt.—The invention consists mainly in the arrangement of a beveled ring, in connection with the vertically adjustable tube, whereby the blast is prevented passing into the space between said tube and the casing of the stack, and also whereby cinders or sparks are deflected into the main ascending current, when they fall into said space.

IMPROVED WATER WHEEL.

James J. Bourgeois, St. Cloud, Minn.—This invention relates to certain improvements in water wheels; and it consists principally in the peculiar construction of the gate or cut-off. Two horizontally moving slides are provided with rack bars with pinions between the same, so that the slides move in unison in opposite directions, to open or close above the center of the wheel.

IMPROVED ORE CONCENTRATOR.

James V. Pomeroy, Col. Ter.—This inventor now improves on the ore concentrator patented to him under date of May 11, 1875, so that the operation of the same is more effective, and the same can be worked with or without the concentrating pans. The supporting table is constructed with a step-shaped bottom, that forms a series of levels for the concentrating pans, the steps and head walls producing a wave action of the water in each level or pan. The center of gravity of the table may be changed, and a heavier or lighter shock be imparted to the same, according to the quality of the material. A level of greater length is arranged at the head of the table, and on the same is placed an endless belt, on which the pulp is fed through a hopper that is hinged at the head of the table, and seated watertight on the belt.

IMPROVED STEAM PLOW.

B. S. Benson, Baltimore, Md.—This invention contemplates the manufacture of a steam plow which shall work with revolving blades that cut the soil with fingers, separate the soil from the growth with pickers, and carry the pulverized earth to the rear. It is also provided with a sifter in the rear and a box to receive the grass, weeds, and roots; also a rear caster wheel journaled in a pulley ring to govern the direction of travel; also an attachment to this wheel, consisting of a detachably clamped frame, so that it may be adjusted to suit the changing line of gravity on lands of different inclination; also with a device for holding up the plows in traveling from field to field, or to graduate the depth at which they shall work.

IMPROVED FURNACE FOR STEAM BOILERS

Charles E. Robinson, Brooklyn, N. Y.—This invention relates to improvements in furnaces for burning gases of petroleum or other liquid hydrocarbons. The attempts heretofore made to utilize petroleum as fuel for this purpose, more especially in locomotive boilers, have failed of the desired success chiefly because the combustion of gas or gases derived from said fuel has been attempted at too low a temperature; and secondly, for want of sufficiently free admission of air to the furnace chamber. The difficulties are overcome in this invention by dividing the furnace chamber into two parts, by means of a perforated diaphragm, the same thus forming the top of the chamber in which the combustion is begun, and the bottom of the chamber in which it is perfected. The bottom of the primary combustion chamber is formed by a series of inclined perforated plates, which are joined at their upper and lower edges, and by which the air is admitted in the requisite quantity and in a highly heated condition.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED SURFACE PLANER.

Wm. C. Margedant, Hamilton, Ohio.—This invention relates to certain improvements in that class of surface-planing machines which plane both above and below the cutter head; and it consists partly in making the cutter head and its upper adjustable table together adjustable above a lower stationary table. It consists more especially, however, in the construction of the cutter head, which is made with three straight cutting knives, arranged in such a manner as to produce a shear cut. To produce this result, one end of the cutter head shaft is made larger than the other, and the end of the knives upon the small end of the shaft are correspondingly advanced to compensate for the first inclination, thus producing, by the double angle, a shear cut with a straight knife.

IMPROVED EXTENSION TABLE.

Ansel D. Jones and Samuel L. Jones, Kirksville, Ky.—These inventors propose to connect the legs of the table to a lazy tongs frame for extension purposes. They consider that the frame can be constructed cheaper than can the usual tongued and grooved sliding sections, while its adjustment is easier.

IMPROVED HINGE.

Frederich Toedt, New York city.—This is an improved butt hinge for doors of all kinds, by which the same are raised when being opened, and closed by their own weight, dispensing thereby with the threshold. The hinge has a wing plate with a spindle and fixed inclined washer, on which the correspondingly inclined sleeve end of the other wing plate slides, raising thereby the door. The advantage of the hinge is that it allows the laying of carpets from one room to another on an even surface.

IMPROVED SOFA BEDSTEAD.

John B. M. Fifield, Philadelphia, Pa.—This bed sofa is so constructed that it does not require to be moved away from the wall when it is to be arranged as a bed; it may be changed from one arrangement to the other with one movement, and it is so constructed that, when arranged as a bed, the cushions may be covered with ticking, and thus kept clean. The back is made in two parts, and so arranged that the lower part may be swung forward to enable the upper part to be turned down into line with the seat to form a part of the bed bottom. A piece of ticking is attached to the rear of the seat and to the back, so that, when the latter is turned down, the cloth becomes extended over the entire bottom.

IMPROVED BEDSTEAD AND MATTRESS.

John J. Bowen, Richmond, Va.—This invention relates to an improved construction of bedstead and mattress, each constructed so as to be specially adapted to the other, whereby the cost of the mattress may be considerably reduced. It consists in a bedstead having a raised head support in combination with a mattress shortened by the width of a bolster, and provided with a bolster attached to its upper head end, which rests upon the head support of the bedstead, by means of which all of the comforts of an ordinary bed are available, and the cost of the matttress lessened by dispensing with a transverse section equal to the width of the bolster.

NEW AGRICULTURAL INVENTIONS.

IMPROVED MILK COOLER.

Bruce C. Bort, Chateaugay, N. Y.—This invention relates to improvements in the milk coolers for which letters patent have been granted to B. C. Bort and T. Bryant, under date of June 18, 1872, and November 5, 1872. The invention consists of a water cooler or vat which has a hollow longitudinal partition, with entrance and exit apertures, and lateral perforated partitions, in connection with a detachable pan seated thereon. The milk pan is thus acted upon by the cold water at every part of its bottom, so that an effectual cooling of the milk is produced, while the detaching of the milk pan admits the thorough cleaning of the cooler.

IMPROVED COMBINED DRILL AND FERTILIZER.

Aladan S. Wishart, Lumberton, N. C.—The object of this invention is to provide a combined drill and fertilizer, or a drill which is convertible at will into a broadcast fertilizer. It consists in a shaft carrying feed wheels or stirrers, located parallel with the axle, and actuated through gear wheels by the driving wheels. An adjustable hopper is arranged upon the frame, so that, when it is disposed longitudinally, a single one of the feed wheels revolves in an adjustable orifice at the bottom to constitute a drill for planting cotton and other seed; and when the said hopper is arranged transversely, or parallel with the shaft, all the said feed wheels revolve in the said hopper and act as stirrers to sow broadcast the guano or other fertilizer.

IMPROVED DITCHING MACHINE

John E. Landrum, Hebron, Ohio.—As the machine advances, the earth is excavated by an inclined shovel—upon which the loose soil passes—entering an upwardly inclined shoot. In the latter is an endless chain, driven by the wheels of the ditcher, through the medium of suitable gearing, and carrying hoes at intervals along its length. These hoes raise the earth to the top of the machine and deliver it to the discharge spout.

IMPROVED GRAIN BINDER.

John J. Atwater, Medford, Minn.—This is a remarkably ingenious machine, including eleven entirely novel devices. There is an apparatus for collecting the grain, forming it into a gavel, and dropping upon a table, along which twine, leading from a ball of the same, is extended. This done, the cord is carried over the gavel, and both ends brought under a clamp. A portion of the twine enters a slot in a needle, which is suitably manipulated to make a knot. Lastly, the cord is cut clear of the ball, and the gavel thrown out.

NEW HOUSEHOLD ARTICLES.

IMPROVED POTATO MASHER.

Robert Crane, Jr., Columbia, Pa.—This implement consists of a handle, and a wheel-shaped device fastened thereto. The latter is formed of a ring and radial blades, the latter being set spirally or inclined to the plane of the wheel, so as to mash as well as cut when pressed down through the potatoes.

IMPROVED WEATHER STRIP.

Jesse Chandler, Barry, Ill.—This invention consists in retaining a hinged weather strip upon the threshold of a door by an adjustable stop plate, having an inclined cam part at the door casing for retaining the strip securely on the sill.

IMPROVED LAMP PENDANT.

William M. Underhill, Oconto, Wis.—This is a lever attached to a link suspended from the ceiling, having a long arm which terminates in a hook, and a short weighted arm. Directly under the point of suspension of the lever there is a bend in the long arm, to which the lamp is attached, so that the lever remains horizontal while the lamp hangs vertical. When it is desired to lower the lamp, the same is simply slid out to the hook end of the lever, which descends by the weight of the fixture.

NEW TEXTILE MACHINERY.

IMPROVED SPINNING WHEEL.

John J. Kendall, Greensborough, N. C.—The bench consists of a crooked plank set edgewise on the legs, and having a curved standard at the front end. This arrangement allows the wheel standard to be bolted on the sides so as to be held securely, and at the same time be shifted to different positions readily. The general arrangement is such that the whole standard can be shifted up or down to accommodate the hight of the wheel, or the head can be turned around its bolt to swing the spindle toward the wheel in suitable position to one standing or sitting at work.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

Notes & Queries

P. M. will find directions for bronzing spring steel on p. 283, vol. 31. -L. W. R. should use a saturated solution of alum in making the hard cement with plaster of Paris. Door knobs are usually screwed into doors.—F. McN. can use paraffin varnish to preserve his tools from rust. See p. 283, vol. 31.—G. M. R. is informed that nitric acid is commonly used for etching on steel. For directions for cleaning marble, see p. 330, vol. 32.—S. R. will find a recipe for brown soap on p. 331, vol. 31. T. T. B. and M. can make emery belts for sand-papering spokes by following the directions on p. 304, vol. 32.—O. S. will find a recipe for paste that will adhere to tin on p. 26, vol. 34.—W. F. B.'s queries should be referred to a physician.—A. J. E. will find a recipe for plumber's solder on p. 58, vol. 30. It melts at 360° Fah.—J. K. W. will find a recipe for a blackboard composition on p. 91, vol. 30.—J. K. N. will find a description of the Stevens battery on p. 87, vol. 31.—F. O. X. will find simple directions for electroplating on p. 133, vol. 30.—T. B. G. is informed that we do not work out schoolboys' problems, and political questions are not in our line.—G. W. B. will find a simple process for nickel plating on pp. 155, 235, vol. 33.—A. B. D. will find directions for polishing woodwork on p. 315, vol. 30.—C. S. B. will find good recipes for rendering glass opaque on p. 264, vol. 30. The process for blackening gun barrels is described on p. 208, vol. 28. Files can be renewed by the process described on p. 361, vol. 31, which is a good one.—R. W. K. will find directions for a black finish on wood on p. 299, vol. 30.—C. J. M. can cut his glass jars by using the process described on p. 49, vol. 33. —L. S. will find directions for making plaster casts look like marble on p. 68, vol. 29.—G. E. R. will find directions for bronzing iron castings on p. 283, vol. 31. This also answers J. L. T.—J. L. T. will find a description of the Chutaux battery on p. 27, vol. 34, and one of the Grenet, on p. 219, vol. 32.—J. C. T. will find directions for waterproofing paper on p. 146, vol. 31.—J. N. will find a recipe for fish glue on p. 408, vol. 24.—W. C. will find a recipe for mica varnish on p. 241, vol. 32.—A. J. will find directions for grinding a parabolic mirror on p. 276, vol. 30.—N. J. will find, on reference, that the proportions of a flywheel are described on p. 288, vol. 28.—P. R. will find a description of the hydraulic ram on p. 209, vol. 31. For an improved arrangement of flouring burrs, see another page of this issue.—J. P. can make battery carbons by the method described on p. 35, vol. 33.—W. C. E. will find that the lap and lead on a steam engine are fully described on p. 101, vol. 32.—D. P. will find directions for preserving wood from decay on p. 319, vol. 31.—M. J. will find directions for making an induction coil on p. 219, vol. 32.—F. C. will find a description of the process of obtaining albumen from blood on p. 344, vol. 31.—J. W. can waterproof his leather boots by the process described on p. 155, vol. 26.—N. K. will find a recipe for fulminate of silver on p. 90, vol. 31.—J. C. K. can fireproof his shingles by the process described on p. 280, vol. 28.—F. J. will find a description of the moon's variations on p. 251, vol. 31.—F. C. can harden tallow by the method described on p. 201, vol. 34.—F. N. will find a description of M. Coignet's artificial stone on p. 124, vol. 22.—J. Q. will find directions for making a hydrogen lamp on p. 242, vol. 31.—J. T. can tan skins with the fur on by the process described on p. 232, vol. 26.—F. J. will find a recipe for solder for gun barrels on p. 353, vol. 27.—J. K. will find directions for stuffing and mounting animals on p. 250, vol. 30.—J. W. is informed that water glass is silicate of soda, frequently advertised in our columns. This also answers J. S.—C. T. will find a recipe for a black enamel on iron on p. 208, vol. 26.—J. W. C. will find a recipe for an indelible ink on p. 120, vol. 28, and for a black, on p. 112, vol. 27.—R. K. will find a recipe for marine glue on p. 43, vol. 32. Muriate of ammonia is prepared for inhalation by the process described on p. 315, vol. 31.—R. Y. will find a description of a pantagraph on pp. 90, 179, vol. 28.—W. C. will find the dimensions of the Great Eastern on p. 346, vol. 32. The proportions of safety valves are given on p. 363, vol. 29.—J. W. T. will find a description of salicylic acid on p. 324, vol. 32.—F. J. will find a description of the madstone (the virtues of which are believed in only by the ignorant) on p. 266, vol. 26.—W. C. T. can produce a black finish on German silver by the process detailed on p. 283, vol. 31.—N. T. will find directions for making gelatin relief plates on p. 272, vol. 32. —W. T. S. will find a description of the process of lithography on p. 298, vol. 31.—W. F. can harden his screw-cutting plates by the process detailed on p. 75, vol. 28.—N. P. can repair his millstones by using the cement described on p. 251, vol. 31.—M. W. will find directions for making a sun dial on p. 409, vol. 29.—C. J. will find that a method of wire rope transportation is described on p. 370, vol. 31.

(1) T. W. D. asks: Will putty made of linseed oil and Spanish whiting stand the weather? A. Yes.

(2) J. L. McM. says: 1. I wish to engage in the manufacture of potash on a small scale. Will you please give me the details of the process? A. The substance known in chemistry as potassic carbonate is generally termed potash, because it was formerly obtained from wood ash, which, after lixiviation with water, was evaporated to dryness in cast iron pots. You give no intimation in regard to your source of supply; we can give no method, therefore, until we know from what material you expect to derive your potash. Below we give the sources whence potassa is industrially obtained: The inorganic sources of potassa.—1. The salt minerals of Stassfurt. 2. Felspar. 3. Sea water. 4. Saltpeter. The organic sources of potassa: 5. Ashes of plants. 6. The residue of the molasses of beet root sugar after distillation. 7. Seaweeds, as a by-product of the manufacture of iodine. 8. The suint of the crude wool of sheep.

(3) W. R. T. of Manchester, England, says: How can I make iodine green, used by calico printers? A. Iodine green is obtained by the following process: One part acetate of rosaniline, 2 iodide of methyl, and 2 methylic alcohol are heated together for several hours under a high pressure, or (on a small scale) in a sealed tube. When the operation is finished, the result is a mixture of violet and green pigments dissolved in methylic alcohol. The volatile substances having been driven off by distillation, the mixture of pigments is put into boiling water, wherein the green is completely dissolved, while the violet remains insoluble; the former is precipitated by a cold saturated solution of picric acid in water; the ensuing precipitate—picrate of iodine green—is collected on a filter, rapidly washed with the smallest possible quantity of water, and, after having been partly dried, brought into commerce as a paste. The crystalline iodine green, free from picric acid, has the formula $C_{32}\ H_{33}\ N_3\ OI_2$.

(4) M. M. G. says: I find in use in Delaware the leaves of a small bush that grows in the swamps and on the borders of lakes and ponds. It possesses the peculiar property of diminishing or preventing the accumulation of fat in persons disposed to obesity. I have been unable to find that it is known to the medical profession, and I do not know what its proper name is; it is called here the swamp shrub. It is a beautiful bush, growing to the hight of 2½ or 3 feet, and bears a beautiful purple flower. It blooms in July and August, and is quite ornamental in comparison to the surrounding rubbish among which it grows. My attention was called to it by several corpulent individuals, who stated that they could diminish their proportions at leisure at the rate of 5 or 6 lbs. per week. Being quite lusty, I was induced to try it, with the following result: In five weeks I diminished my weight from 210 lbs. to 190 lbs., when my clothes commenced to feel uncomfortably large, and then I stopped. I took a dose of the infusion when convenient. When my fat accumulates, I take to drinking it; and in a short time the oppressiveness of flesh diminishes. If there is anything in medicine that will do this, I am not aware of it. What is the botanical or medical name of the shrub? A. Your description is insufficient to enable us to determine the plant. Send specimen of shrub and its root, and, if possible, full description of its flower.

(5) G. W. D. asks: Can you give me a convenient and inexpensive process for removing the moisture from common air, without the use of heat? A. Force the air through vessels containing quicklime. The surface of exposure containing the quicklime should be large.

(6) L. C. asks: How can I reduce the black or brown oxide of mercury to a metallic state? I have a quantity, which I have pounded in an iron mortar with water, and a portion of it has been reduced; afterwards I distilled it at a high heat, and but little came over. The remainder is a fine brown powder. Can I reduce it by any means except by the wet process, and how? A. Take equal parts of powdered charcoal and dry carbonate of soda, and heat with the oxide until decomposition ensues. Metallic mercury will separate.

(7) S. R. B. asks: 1. Have fishes an auditory apparatus? Do they hear distinctly? A. "The ear of the fish (almost always entirely within the cranium, on the sides of the brain) consists essentially of a vestibule and 3 semi-circular canals, which receive the vibrations of the integuments and cranial walls; there is rarely anything that can be called an external ear, drum, or tympanic cavity; loud, sudden, and strange sounds frighten fish; in ancient, and even in modern times, they have been taught to come and receive food at the tinkle of a bell, or the pronunciation of pet names."—*American Cyclopædia*, vol. 7, p. 583.

(8) H. D. M. asks: Will you mention a good cheap way to powder copper (sheet or ingot) so that I can obtain the pure powder? A. There are four methods: 1. Granulate the copper by allowing the molten metal to fall through a sieve into cold water. 2. By dissolving up the copper in sulphuric acid, and adding scraps of iron, the copper will be precipitated in the metallic state. 3. By bringing the acid solution in the galvanic current in such a manner that spongy metallic copper will be precipitated at the negative pole. 4. By heating oxide of copper in a stream of hydrogen gas.

(9) C. F. T. asks: How can I dye powdered chalk or tripoli to a dark pink or carmine, so that vinegar or alcohol will not change the color? A. Use rouge.

(10) A. asks: Can cider be pressed from the fruit, boiled down to one half, then stored away, so as to keep any length of time, and then be diluted and fermented, and distilled into a good article of apple brandy? A. We see no objection to the process, provided that, during storage, air be excluded and the other usual precautions taken.

Is the manufacture of oxalic acid from sawdust, in a country where sawdust is cheap, practicable? A. If the sawdust be mixed with a solution of caustic potassa, and exposed to a heat considerably above 212° Fah., it will be partially decomposed and converted into oxalic acid, which will be found in combination with the alkali. Much of the oxalic acid of commerce is made in this way.

(11) L. R. asks: Is there an instrument that will indicate the degree of moisture in the earth? A. There is no instrument for this purpose? The moisture may be determined as follows: Weigh out ½ lb. of the earth immediately after taking it from the ground; transfer to an oven where the temperature is maintained at 212° Fah. until the earth is completely dried. After cooling, weigh; the difference in the two weights gives the amount of moisture.

(12) J. W. N. says: Open coal fires are certainly desirable things; but as they are not very common, I infer that, for some reason, open coal grates have not yet been made successful. Please inform me wherein they fail. A. The coal grate fire is very common here. No failure.

(13) S. A. F. says: I am building a boat 28 feet over all, and 25 feet 6 inches on the keel; she is 5 feet 10 inches wide, and draws 14 inches forward and 30 inches aft. Her engine is 4½x5 inches, with a surface condenser and a boiler 30 inches diameter by 54 inches high, with 40 two inch tubes. She has a 30 inch propeller. Please tell me what speed I can get out of her. I carry 100 lbs. pressure. A. That question can best be answered after the boat is done. We will hazard a guess, however, that, if the boiler steams well, the speed of the boat will be about 6½ miles an hour in still water. Let us hear from you after you have made a run.

(14) H. J. S. says: A. claims that if 100 tuns pressure compresses 2 bales cotton to half their thickness, when placed side by side, about half the pressure or same force will equally compress said cotton if the bales are placed one on top of the other. I claim that it will not. Please decide. A. We incline to A.'s opinion.

(15) W. S. says: 1. I propose to build a cylindrical copper boiler, the shell to be made with a butt joint, a strip of copper being placed on the inside over the seam and riveted. Will this joint be as strong as a double-riveted lap joint? A. Yes, if properly proportioned. 2. What is the greatest strain per square inch of section that should be placed upon copper, when used in a boiler? A. With a double-riveted joint, 3,200 lbs. 3. Can you give me a formula for calculating the strength of copper boilers, similar to the formulæ in use for iron boilers? A. Use the constant for working strength of copper, as above, in the formula for iron boilers. You will find rules given at length in "Wrinkles and Recipes."

(16) L. H. P. asks: Where can I find a rule for the proper number, size, and arrangement of tubes for a modern tubular boiler? A. You will find some useful hints in Forney's "Catechism of the Locomotive."

(17) C. W. C. says: I have a composition steam cylinder which I use for an hydraulic engine to blow an organ; but I have not pressure enough to give the required speed, which is 20 strokes per minute under 20 lbs. per inch pressure. I propose to use carbonic acid gas as a substitute for water, and to use a cylinder 2 feet by 4 feet filled to 200 lbs. per square inch pressure. Is the following calculation correctly based? Capacity of cylinder 24×48=21714·72 cubic inches; capacity of engine 3×3=21·204 cubic inches=1014·6 half strokes÷2=507·3 whole strokes. 507·3×200 (lbs. pressure of cylinder)÷20 (lbs. pressure of engine)= 5073÷20 strokes per minute÷60 minutes per hour= 4 hours 13 minutes+. A. The calculation is correct: on the assumption that the pressure of the gas is inversely as the volume. You can scarcely expect to realize the performance as given by this calculation, which does not take into account some practical considerations. 2. Would the gas corrode the engine? A. We think not.

(18) H. S. M. says: I am about to build a small boat. I have 2 engines, connected on one shaft at quarter centers, of 3 inches bore and 6 inches stroke, cutting off at ⅝ stroke. The boiler is large enough to make all the steam they can use; it is of an upright tubular form. Will these engines do for a boat that will carry the necessary machinery and about 15 persons? If so, please tell me the proper dimensions of the boat and wheel. A. Make a boat 30 feet long, and of 8 feet beam. Use a propeller 30 inches in diameter and of 42 inches pitch.

(19) L. S. C. says: 1. In the sugar-growing portion of Louisiana we use our boilers only two months in the year. During the other ten months we find that much injury, resulting from our damp climate, is sure to ensue. The under side, flues, and portions where the brickwork touches cannot well be painted. What can you recommend to protect such boilers? A. It might be well to remove the brickwork (a portion at a time, if more convenient) and clean and paint the whole boiler. Then, in replacing the brickwork, set it with hydraulic cement, taking care to make a tight joint. 2. As between two boilers, each of suitable size to furnish 15 horse power, one being two flue, the other a plain cylinder, about what percentage more fuel would the latter require than the former, steam being used at 80 lbs., and fuel required to raise cold water to 80 lbs. not being counted? A. The difference would be trifling, if each boiler was acting in an efficient manner.

(20) R. C. T. asks: How much friction is there between iron and ice, as in skating? How do you calculate it? A. It can only be determined by experiment. If any of our readers have any data bearing on the subject, we would be glad to hear from them.

(21) A. W. says: I have had experience in running stationary and locomotive engines, and I would like to qualify myself for the position of master mechanic. How shall I proceed? A. There are schools in this vicinity and elsewhere, in one of which it might be well for you to spend a year or two; and after that it would be advisable to go into a shop or drawing room. We think the expenses at one of these schools, including board, tuition, books, etc., would be at least $400 a year.

(22) W. A. asks: How large a boat can be driven with a pair of cylinders 4x6 inches, at the speed of 10 miles an hour, pressure of steam being 80 to 100 lbs.? What size of propeller wheel will be suitable for the boat and engines? A. You can use a boat 30 feet in length, and a propeller 32 inches in diameter. We think it doubtful, however, whether you will realize the speed named.

(23) C. M. B. asks: Will a float, with just sufficient buoyancy to support 10 lbs. in cold water when not confined, support more weight if placed on the water in a steam boiler, with a pressure of steam of 200 lbs. to the inch? A. It will not support quite as much, because water expands when heated, and has less weight for a given volume.

(24) A. M. asks: In grinding rolls by means of an emery wheel, what should be the travel of the roll and of the wheel? A. It depends on the size of the rolls and the size of the emery wheel employed, and is easily discovered by experiment.

(25) H. W. H. asks: Is there any means by which I can find the pressure of steam in a boiler with the safety valve alone, without the use of a steam gage? A. You will find rules for such calculations in Bourne's "Handbook of the Steam Engine."

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

L. A. S.—It consists of heavy spar or sulphate of baryta, along with oxide of iron.—J. E. H.—It is pyrites.—R. W. H.—All the specimens are composed of scales of mica and small crystals of hornblende, which give them their sparkling character, imbedded in felspar and quartz.—W. M.—One specimen is pure quartz sand; the other is quartz sand mixed in with clay. Of no value for shipment.—G. W. L.—No. 1 is mispickel. No. 2 is pyrites. Nos. 3 and 4, pyrites in quartz rock. No. 5 is quartz rock which, like the foregoing, is very possibly auriferous. It would require a larger quantity to determine this, and a careful gold assay would be required.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On the Measurement of Light. By H.
On the Tails of Comets. By C. E. M.
On Spiritualism. By F. W. E.
On Burning Coal Dust. By W. F. S.
On Gear Indices. By B. P. G., by S. M., and by G. B. K.
On Coprolite Beds. By E. K.
On the Gateways of Nations. By W. T. S.
On "Etheric" Force. By J. P. H.

Also inquiries and answers from the following:

S.—H. P.—J. A. B.—R. B. S.—W. S. O'C.—P. J. R.—J. C. H.—E. L. W.—H. J. T.—J. F. D.—E. J. D.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who sells aniline black? Where can flat-bottomed steamers be purchased? Who makes steel springs, suitable for use in a spring power? Who sells magnetic chains for medical purposes?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

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DESIGNS PATENTED.

8,836.—COOK STOVE.—N. S. Vedder, Troy, N. Y.
8,837.—STOVES.—N. S. Vedder, Troy, N. Y., *et al.*
8,838.—COOK RANGES.—N. S. Vedder, Troy, N. Y., *et al.*
8,839.—STOVES.—N. S. Vedder, Troy, N. Y., *et al.*
8,840 & 8,841.—STOVES.—N. S. Vedder, Troy, N. Y., *et al.*
8,842.—COOK STOVE.—N. S. Vedder, Troy, N. P., *et al.*
8,843.—STOVES.—N. S. Vedder, Troy, N. Y., *et al.*
8,844.—COOK STOVES.—N. S. Vedder *et al.*, Troy, N. Y.
8,845.—PAPER BOX.—I. Birgé, Philadelphia, Pa.
8,846.—CUTLERY HANDLES.—E. L. Brittin, Derby, Conn.
8,847.—TOY BALLOON.—H. S. Kerr, Philadelphia, Pa.
8,848.—LAMP CHIMNEYS.—F. S. Shirley, New Bedford, Ms.
8,849.—BOTTLES.—B. Simon, Scranton, Pa.
8,850.—RANGE.—N. S. Vedder, Troy, N. Y.
8,851.—STOVES.—N. S. Vedder, Troy, N. Y.

SCHEDULE OF PATENT FEES.

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On application for Design (7 years).....$15
On application or Design (14 years).....$30

CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA, December 4 to December 14, 1875.

5,463.—D. W. De Forest, Brooklyn, N. Y., U. S. Mechanism for propelling sleds. Dec. 4, 1875.
5,464.—C. W. Williams, Rochelle, Ill., U. S. Hay loader. Dec. 4, 1875.
5,465.—R. L. Webb, New Britain, Conn., U. S. Box coffee mill. Dec. 4, 1875.
5,466.—F. N. Du Bois, New York city, U. S. Machine for making plumber's traps. Dec. 4, 1875.
5,467.—D. L. Chase, Boston, Mass., U. S. Steam governor. Dec. 4, 1875.
5,468.—O. Juil, Orangeville, Ont. Turbine water wheel. Dec. 4, 1875.
5,469.—E. A. Rice, New York city, U. S. Seats for vehicles. Dec. 4, 1875.
5,470.—T. Snell *et al.*, Toronto, Ont. Paint brush bridler. Dec. 4, 1875.
5,471.—I. Milette, Three Rivers, P. Q. Self-acting sluice doors and lock gates for canals. Dec. 4, 1875.
5,472.—S. Lee, Ottawa city, Ont. Shoe rack. Dec. 4, 1875.
5,473.—D. N. B. Coffin, Jr., Newton, Mass., U. S., *et al.* Chain stopper. Dec. 9, 1875.
5,474.—A. S. Dennison *et al.*, Watertown, N. Y., U. S. Paper bag. Dec. 9, 1875.
5,475.—A. S. Dennison *et al*, Watertown, N. Y., U. S. Waterproof bag. Dec. 9, 1875.
5,476.—J. P. Taylor, Elizabethton, Tenn., U. S., *et al.* Machine gun. Dec. 9, 1875.
5,477.—D. N. B. Coffin, Jr., Newton, Mass., U. S., *et al.* Capstan and windlass. Dec. 9, 1875.
5,478.—J. Shedd, Waltham, Mass., U. S. Window blind fastener. Dec. 11, 1875.
5,479.—D. E. Lillis, Jackson, Miss., U. S. Foot treadle. Dec. 11, 1875.
5,480.—A. Marland, Pittsburgh, Pa., U. S. Making nuts. Dec. 11, 1875.
5,481.—I. Casgrave, Chatham, Ont. Machine for pumping water out of vessels, etc. Dec. 11, 1875.
5,482.—H. Knight, Liverpool, England. Manufacture of certain oxides and sulphides. Dec. 11, 1875.
5,483.—J. Lang, Arnprior, Ont. Mop wringer. Dec. 11, 1875.
5,484.—R. Forward, Cincinnati, Ohio, U. S. Paddle wheel. Dec. 11, 1875.
5,485.—J. E. Nute *et al.*, New Glasgow, N. S. Pumping water from ship holds, etc. Dec. 11, 1875.
5,486.—J. C. Schoonmaker, Hamilton, Ont. Combined stove pipe shelf and dryer. Dec. 11, 1875.
5,487.—H. Reed, Vineland, N. J., U. S. Tanning apparatus. Dec. 11, 1875.
5,488.—W. Dippert, Des Moines, Iowa, U. S. Harness pad press. Dec. 11, 1875.
5,489.—J. McLean, St. George, N. B. Scale pan, etc. Dec. 11, 1875.
5,490.—J. C. Schoomaker, Geddes, N. Y., U. S. Making lightning conductors. Dec. 11, 1875.
5,491.—J. E. Fisk, Salem, Mass., U. S. Whitening and buffing leather. Dec. 14, 1875.
5,492.—J. R. Lantz *et al.*, Marrowbone, Ill., U. S. Adjustable wagon axle. Dec. 14, 1875.
5,493.—R. K. Boyle, New York city, U. S. Electric telegraph. Dec. 14, 1875.
5,494.—W. Ellard, Skeads Mills, Ont. Cutting belt nippers. Dec. 14, 1875.
5,495.—A. C. Snowden, South Norwalk, Conn., U. S. Horse overshoes. Dec. 14, 1875.
5,496.—E. Gray, Chicago, Ill., U. S. Transmitting musical sounds telegraphically, etc. Dec. 14, 1875.
5,497.—W. H. Newton, Chicago, Ill., U. S. Hydraulic and peat excavators. Dec. 14, 1875.
5,498.—J. Foley, Orangeville, Ont. Printer's quoin. Dec. 14, 1875.
5,499.—G. Lupton, Indianapolis, Ind., U. S. Sheet metal pipe elbow. Dec. 14, 1875.